

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE Annual General Meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, January 7th, 1898, at 5-15 P.M.

President :—Surgeon-Major-General G. Bainbridge, M.D., F.R.C.S.I., in the chair.

Present :—Surgeon-Lieut.-Col. W. K. Hatch, Dr. J. T. Leon, Surgeon-Lieut. H. E. Stadden, Dr. C. R. Marrett, Surgeon-Major H. P. Dimmock, Dr. L. P. doRozario, Dr. Temulji Bhicaji Nariman, Dr. Pechey-Phipson, Dr. (Miss) Benson, Dr. (Mrs.) Slater, Dr. R. M. Kalapesi, Brigade-Surgeon-Lieut.-Col. J. S. Wilkins, Surgeon-Major C. Monks, Surgeon-Major W. H. Quicke, and Surgeon-Capt. H. Herbert.

Business :—

I. The minutes of the last meeting were taken as read and confirmed.

II. The names of the Committee for 1898 were announced.

It was then explained by the President that, owing to a mistake in the circular sent round with the voting papers, no mofussil members had been elected. One member (Surgeon-Lieut.-Col. D. C. Davidson) had received votes, but not so many as certain members resident in Bombay. Since it was desirable that up-country members should be represented on the Committee, it was put to the meeting whether Surgeon-Lieut.-Col. Davidson should be elected, or whether the votes must stand. The latter proposition was carried.

With the consent of the meeting Brig.-Surgeon-Lieut.-Col. Beamish, A.M.S., replaces Surgeon-Major M. O'C. Drury, A.M.S., on the Committee.

The new Committee therefore consists of the following members :—

President—Surgeon-Major-General G. Bainbridge, M.D., F.R.C.S.I.

Members—Surgeon-Col. G. W. R. Hay, M.D.; Brigade-Surgeon-Lieut.-Col. F. C. Barker, M.D., F.R.C.S.I.; Surgeon-Lieut.-Col. H. W. B. Boyd, F.R.C.S.I.; Surgeon-Lieut.-Col. W. K. Hatch, M.B., C.M., F.R.C.S.; Surgeon-Major H. P. Dimmock; Brigade-Surgeon-Lieut.-Col. J. M. Beamish, M.D.; Dr. Edulji Nashirvanji; and Dr. Temulji Bhicaji Nariman.

Surgeon-Capt. H. Herbert was re-elected Secretary and Treasurer.

The statement of accounts for the year ending 31st December 1897 was passed.

The following papers were then read :—

1. Demonstration of the Operation of Subcutaneous Symphysiotomy, by Surgeon-Major H. P. Dimmock.
2. A case of Cystic Disease of Kidney, by Surgeon-Lieut.-Col. W. K. Hatch.
3. On a method of Staining Ringworm and Allied Fungi, by Dr. J. T. Leon.

Two patients with Syphilis were shewn by Surgeon-Lieut.-Col. W. K. Hatch.

DEMONSTRATION OF THE OPERATION OF SUBCUTANEOUS SYMPHYSIOTOMY.

BY SURGEON-MAJOR H. P. DIMMOCK.

The operation of symphysiotomy, as performed subcutaneously, is so simple and of such efficacy in certain cases of difficult labour which would otherwise be terminated by craniotomy, that I should like to see it applied more generally. The antiseptic precautions must be very complete and thorough ; the instruments required for it are few, and consist of a sharp-pointed tenotomy knife, a silver female catheter, a blunt-pointed curved bistoury, a herniotomy knife, and a sharp-pointed curved bistoury, which is sometimes required if the posterior margins of the symphysis pubis are very close together. The catheter is used to depress the urethra in its entire length during the whole operation.

The puncture in the skin is made opposite the subpubic angle, a little to one side of and above the clitoris, by means of the sharp tenotome, guarding the anterior wall of the vagina and the urethra by the forefinger of the left hand in the vagina. The blunt-pointed curved bistoury is then insinuated beneath the skin and finally under the subpubic ligament, which is cut through. The posterior ligaments of the pubic joint are then gradually nicked through and the bistoury is with-

drawn, the remaining strands of the ligaments being divided by the herniotomy knife when the operation of delivery is completed. The forceps are now applied and the separation of the symphysis is carefully noted by the forefinger of the left hand, while the right hand exerts traction on the forceps; or, if it is a breech presentation or turning has been effected, while the usual manipulations are being done. The separation takes place to the extent of $1\frac{1}{4}$ inches as a rule, although I have observed it even greater than this, as much as $1\frac{1}{2}$ or $1\frac{3}{4}$ inches. Extreme separation is dangerous, and great care is required, as this is the stage at which severe damage can be done to the structures. The injuries of the most importance are tearing and stripping of the abdominal layer and anterior *cul de sac* of the peritoneum, injury to the urethra, and laceration of the anterior fourchette. The latter is the most usual and requires very careful and accurate repair. A hæmotoma often forms at the seat of operation, but is, as a rule, easily treated by an ice bag.

After delivery the patient is kept on the side, and a shot bag, weighing about 9 or 9 lbs., is placed over the upper hip. In this way the surfaces of the symphysis are kept apposed and fibrous union takes place very satisfactorily. In proof of this I have done symphysiotomy for a second time on a woman and found quite a strong band of union between the surfaces which had to be cut through in the usual way, and union again took place. I would have brought this patient before the meeting, but unfortunately she has lost her husband, and the child I last delivered, after the second symphysiotomy, has died of plague, and so she has gone away from Bombay. I saw her the other day and she was walking well.

Another case died in hospital of some other disease, and I had an opportunity of dissecting the symphysis, when the union by a strong and thick band of fibrous tissue was easily seen. These patients also walked quite comfortably.

Surgeon-Lieut.-Colonel HATCH enquired whether a plaster of Paris bandage would not be more suitable to fix the hips of the patient than a bag of shot, especially since the convalescence lasted for so long a period.

Mrs. PECHEY-PHIPSON enquired what were Dr. Dimmock's results both as regards locomotion and fatality.

Dr. TEMULJI BHICAJI NARIMAN said it was strange that in England operators preferred the open method to the subcutaneous. He has seen one of Dr. Dimmock's operations, and the after-result as regards power of locomotion had not been satisfactory, though now, one and-a-half years after operation, there was some improvement.

Surgeon-Major H. P. DIMMOCK, in reply said that he thought plaster of Paris a good suggestion as a substitute for the shot-bag, and he would try it. The locomotion of his patients had not been at all impaired except in the case mentioned by Dr. Temulji. Three months' rest was required, and he would not operate unless this could be secured. This was the chief drawback to the operation. He was sorry he had not his mortality figures at hand ; he had published some statistics at the Calcutta Medical Congress. Death after these operations had generally occurred from peritonitis, and this might or might not have been due to the operation.

The PRESIDENT thanked Surgeon-Major Dimmock for his interesting communication.

CYSTIC DISEASE OF THE LEFT KIDNEY.

BY SURGN.-LT.-COL. W. K. HATCH, M.B., C.M., F.R.C.S.

The patient, a Hindoo lad of about 18 to 20, was admitted into the J. J. Hospital on 1st November 1897 complaining of pain in the left side. His family history could not be obtained altogether satisfactorily ; his mother, brother, and sister are alive and healthy. He himself is a mill-hand, has lived one year in Bombay, and with exception of fever, from which he has occasionally suffered, his health has been good. He stated that ten days before admission he was attacked by fever and pain in the left side ; next day the fever left, but the pain continued ; it gradually increased, and he then noticed some hardness in the lumbar region. About the eighth or ninth day the fever returned and the pain became very severe. At the commencement of the illness the bowels were constipated, but acted on the fourth day ; there was no difficulty in micturition, nor was any pain felt radiating from the back to the groin or other part. He had not received a blow or injury of any description, nor had he suffered from a similar attack before. On admission he appeared to be in fair condition, of slight build, but anæmic. He complained of



RECORDS OF TEMPERATURE - PULSE - RESPIRATION - EXCRETÆ &c

Name *Dhukhu Harran* Age *20* Caste *Hindu* Disease *Cystic Kidney* Occupation *Mill Hand*

| Date | 1 st | 2 nd | 3 rd | 4 th | 5 th | 6 th | 7 th | 8 th | 9 th | 10 th | 11 th | 12 th | 13 th | 14 th | 15 th | 16 th | 17 th | 18 th | 19 th | 20 th | 21 st | 22 nd | 23 rd | 24 th | 25 th | 26 th | 27 th | 28 th | 29 th | 30 th | 1 st | 2 nd | 3 rd | 4 th | 5 th | 6 th | 7 th | 8 th | 9 th | 10 th | | |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------|--|
| Days of Disease | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | | |
| TEMPERATURE - FAHRENHEIT'S SCALE | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | M.E. | |
| | 109° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 108° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 107° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 106° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 105° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 104° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 103° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 102° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 101° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 99° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 98° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 97° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 96° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 95° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 94° | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pulse.....M. | 88 | | | | | | 34 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Respiration..... | | | | | | | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motions..... | | | 0 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 | 3 | 3 | | |
| Urine. | ozs. in 24hrs | | | | | | | | 22 | 16 | 50 | 36 | | | | | | | | | 42 | 40 | 34 | 32 | 42 | 44 | 50 | 48 | 56 | 40 | 12 | 27 | 24 | 32 | 24 | 24 | 26 | 9 | 20 | 16 | 32 | |
| | Reaction..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Sp. Gr..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

pains in the left side. On examining this part a swelling with a slightly convex surface was found to extend from the costal margin nearly as low as the umbilicus, and the inner border was an inch from the middle line; it extended backwards towards the spine; it had a smooth surface and fluctuating feel, and by placing one hand in front and another behind, movement could be made backwards and forwards. The swelling was uniformly dull; the dull area extended upwards below the ribs for an inch behind. The pulse was rather feeble, the respiration slightly hurried, and slight cough present; skin hot and dry, tongue somewhat furred, bowels constipated, eyesight impaired. Liver not enlarged. Urine was pale, Sp. G. 1010, of acid reaction, no albumen nor sugar present. Pain in the side was about the same as on admission for the first few days, then it became less, but the swelling was larger on the 9th November. I therefore entered an aspirating needle behind the swelling and drew off about a pint of yellowish fluid with no odour perceptible; no hooklets were present. The urine, which previous to the operation was about normal in amount, diminished to 16 oz. the day after tapping; it did not contain any blood. And for the next few days pain was much relieved and the tumour felt much smaller; the temperature also fell. The tongue continued furred and flabby, and pain was felt to be increased during defœcation, probably from pressure of the abdominal muscles, but as the lad was nervous he exaggerated symptoms a good deal. By the 23rd bulging in the side was again evident. I therefore again aspirated him on the 24th and drew off 25 oz. of fluid as before; in a day or two, however, although the urine had increased to 48 and 56 oz., the bulging gradually recurred. I decided to operate, and on 29th November he was prepared for this in the usual way. On the 30th, assisted by my colleague, Surgeon-Major Quicke, the patient having been chloroformed, I made an incision five inches long on the left side, beginning from the edge of the Erector Spinæ and about one inch below the costal margin and carried forwards obliquely, the tissues being carefully divided. The surface of the cyst, having a translucent bluish appearance, was exposed; it was tapped with a small trocar and then incised. A large quantity of fluid came away with a gush, probably about a pint, but it was not measured. The finger was introduced into the cavity, which had a loculated feel, but no ureter could be made out; an attempt was then made to separate the kidney, but a few adhesions existed above and below. The patient was placed on his right side, the incision was enlarged and the wound kept open by retractors. With the finger and scissors, as required, the adhesions were separated above and below;

in doing this the peritoneum was unavoidably opened below and the intestines exposed; there was also extremely severe hæmorrhage from the turn surface of the kidney, which seemed at first so profuse that I thought a large vessel must have been injured; by firm pressure it was gradually stopped. The lower limit of the kidney not being found, it was ascertained by examination that the organ passed across the spine—in fact, was united with the right one. A silk ligature was therefore passed through the severed tissue and the organ cut across, the renal vessel was then ligatured, and the part removed. On examination it was found to be of a dull red color, the capsule thickened, and to contain several cysts; the largest one having been emptied of fluid, its walls were thick and white; no ureter could be found in connection with the organ. No attempt was made to close the cut peritoneum, but after washing and drying the cavity it was very firmly packed with iodoform gauze, and dry dressings applied; a few sutures were also applied to the other end of the wound. Next day the patient was rather feeble, pulse small, and liquid dressings soiled with blood, which was, however, dry; he was somewhat restless.

Next day, the 3rd, he was more comfortable, as I allowed him to lie on his side; the urine was smelling, 27 oz. passed; no distension of the abdomen, pain felt in back and left shoulder; he vomited four times. He complained of thirst, temperature being 100° in the morning. Urine was still smelling on the 3rd, but clean on the 4th, other symptoms much the same. On the 6th December the dressings were taken off for the first time, and the wound was found quite healthy; they were again changed on the 9th, when a watery discharge, but no pus, was found. On both occasions the gauze was again placed in the cavity. The discharge was purulent on the 11th, when the wound was again dressed. After this the cavity continued to rapidly close, the parts having a perfectly healthy appearance, and he is now nearly well. I here shew you the temperature chart, the amount of urine passed before and after operation; also the patient himself. Unfortunately it still remains undecided as to what the cause of the cyst was; there does not appear to have been any ureter attached to the portion of the operated part. Whether there was one lower down or only a single ureter for the whole united mass I cannot say. This is the first time that I have met with a horse-shoe kidney on the operation

table, although we have had several instances in the *post-mortem* room.

The PRESIDENT asked what had been the thickness of the ligatured portion of the kidney. Had there been any difficulty in securing the ligature? And was there any sign of hilum about this portion? It was a most interesting case because of the abnormality found—the horse-shoe kidney, and on account of the removal of one-half of this structure. He supposed it was quite necessary to remove the disease, even though there was no certainty as to the condition and connections of ureter with the remaining portion of the kidney. The patient had borne the severe operation well, and it was encouraging to hear of the result, on which he complimented the operator.

Surgeon-Lieut.-Col. HATCH said the tissue ligatured was about $1\frac{1}{2}$ inches in diameter; it tapered towards the other side.

TWO CASES OF SYPHILIS SHEWN BY

SURGN.-LIEUT.-COL. W. K. HATCH, M.B., C.M., F.R.C.S.

The first patient, a young man about 20, was absolutely healthy until April, when he contracted a sore on the penis. Afterwards the symptoms were of a tertiary type—severe pains in the bones, lupoid ulcers on arms and legs, infiltration of the body of the penis, epididymitis and hydrocele of left testis, synovitis of the left knee, and much anæmia and debility. The sore on the penis was afterwards phagedœnic in character. I touched it with nitric acid, and put him on mercury and iodide in combination; later I gave inunction with mild Hg. ointment. There has been great improvement up to a month ago, but of late things are at a standstill. I think the case is a useful one for discussion, and I should be obliged by any remarks members may make with reference to it.

The second patient had been extremely obstinate to mercury and also intolerant of full doses. When he came some months ago with a thick secondary eruption, it was only after some weeks' careful treatment that any improvement resulted; after this the rash rapidly disappeared. The man left hospital and came back a month ago much debilitated and with inguinal ulcers. There is great difficulty about the treatment, as salivation is easily caused.

Dr. LEON asked in what form had mercury been given to the patient besides the red iodide in solution.

Surgeon-Major DIMMOCK thought that the effect of mercury was increased by combining it with some antiseptic, *e.g.*, creosote ; smaller doses of the drug were required.

The PRESIDENT asked whether the second patient had not had any sign of syphilis before March last. His symptoms were such as usually came on at a later stage. He was afraid that in the Army cases of syphilis were inadequately treated. Mercury was often administered for a few weeks only, and then the patients being free from symptoms were discharged, and the poison subsequently again declared its presence and undermined their constitution.

Surgeon-Lieut.-Col. HATCH stated that the man showed immediate symptoms between typical secondaries and tertiaries. They usually occurred at a later stage than in this patient. He had known an exactly similar lupoid affection last for years, spreading in some places while healing elsewhere, and leaving large tracts of scar. The question arose whether the phagedœnic sore on the penis might not have been a broken down gumma, but it appeared this was not the case. The man was not intemperate. It was not till the mercury was used in the form of inunction that there was any rapid improvement ; at first the ordinary red iodide (mixture of perchloride and potassium iodide solution) had been given, a little mercury was being still administered and improvement was still going on.

The PRESIDENT remarked that he thought all were agreed that the only drugs of any real use in syphilis were mercury and iodide of potassium. Mercury was the only cure, and he had not heard of any antiseptic being combined with it. He did not think there were any *a priori* grounds for supposing that such a combination would be of service.

NOTE ON A METHOD OF STAINING RINGWORM AND ALLIED FUNGI.

BY J. T. LEON, M.B., B.Sc. (LOND.), D.P.H.

The ordinary *Trichophyton* stains well by Gram's method, but it has the disadvantage of leaving the hairs somewhat coloured by the stain. The method now brought before your notice is the one used by Dr.

Unna, of Hamburg, and shown to me by a former assistant of his now in London. I usually, for ordinary diagnostic purposes, proceed in the following manner :—

Six watch-glasses are taken containing respectively—

- (1) A mixture of ether and alcohol (2 to 1).
- (2) Aniline water solution of gentian violet.
- (3) A solution of iodine in potassic iodide of about twice the strength of Gram's solution.
- (4) Aniline oil with which one drop of strong nitric acid has been rapidly stirred.
- (5) Aniline oil.
- (6) Xylol.

The ether and alcohol mixture is conveniently kept in a small wide-mouthed stoppered bottle. In India I have substituted a mixture of chloroform and xylol, which requires longer to dissolve the fat. The hairs or scales from the skin are left about one minute in the ether solution and are then plunged into the gentian violet, whence they may be in a few seconds transferred to the iodine solution. In this they ought to remain from half to one minute and then be removed to the acid aniline. In this the colour will be seen to be rapidly discharged, and the hairs should be moved about till little or no further discoloration takes place. They are then just passed through the pure aniline and the xylol, and mounted in balsam in the usual way, or may be examined in xylol.

For diagnostic purposes I think this method is very valuable. I can have hairs ready mounted in about five minutes, and have seen ringworm diagnosed by this method on several occasions when the characteristic stubbly hairs seemed to be absent, and yet some very intractable disease evidently existed.

Since I have been in India I have been led to modify the method in the following way:—The only case of fungus disease of the hair which I have come across was one of favus. The boy had very black hair which made the fungus show up much less distinctly. It therefore occurred to me to try if the hairs could not be bleached previous to staining, and I think the results are satisfactory. I gave up the use

of the chloroform, and immersed the hairs in a strong solution of chlorine, made by adding a drop of acid ($H\ Cl$) to bleaching powder. The hairs were left in this for four or five minutes, then *well washed* with water and stained as usual. This gives results, I think, superior to the old method. The only thing is that they may not be quite so permanent, a question which time alone can answer. I show under the microscope some specimens of favus stained in this way, and also one specimen of a fungus from the body, probably *Microsporon Furfur*.

STATEMENT of Accounts for the Year 1897.

| RECEIPT. | Amount. | | DISBURSEMENT. | Amount. | |
|--|-----------|------------|--|------------|-----------|
| | Rs. a. p. | Rs. a. p. | | Rs. a. p. | Rs. a. p. |
| 1897 | | | 1897 | | |
| To Amount of Subscription collected... | 1,200 0 0 | | Paid for printing transactions including No. 8 ... | 390 4 0 | |
| Do. for diagrams. | 20 0 0 | | Clerk's pay for 11 months and 4 days at Rs. 10 per month ... | | |
| Interest ... | 5 10 0 | 1,225 10 0 | One minute book ... | 111 4 6 | |
| Outstanding ... | | 90 0 0 | Rent for hotel room for a meeting ... | 3 0 0 | |
| | | 1,315 10 0 | One ballot box ... | 5 0 0 | |
| | | | Gas bill ... | 6 0 0 | |
| | | | Two cheque books of twelve cheques each. | 1 15 0 | |
| | | | Sundry expenses, postage, &c. ... | 1 8 0 | |
| | | | Refund for diagram. | 83 1 7 | |
| | | | Paid to Photozinc Office ... | 10 0 0 | |
| | | | | 37 8 0 | |
| 1898 | | | Balance in hand with Messrs. King, King & Co. ... | 649 9 3 | |
| Jan. 1 | | | Outstanding ... | 576 0 9 | |
| | 576 0 9 | | | 90 0 0 | |
| | | | | 1,315 10 0 | |

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE usual Monthly Meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, 4th February, 1898, at 5-15 P.M.

President.—Surgeon-Major-General G. Bainbridge, M.D., F.R.C.S.I., in the chair.

Present : Surgeon-Colonel G. W. R. Hay, Surgeon-Major C. Monks, Brigade-Surgeon-Lieut.-Col. F. C. Barker, Brigade-Surgeon-Lieut.-Col. T. S. Weir, Brigade-Surgeon-Lieut.-Col. J. M. Beamish, Surgeon-Major H. P. Dimmock, Surgeon-Capt. P. D. Collis Barry, Surgeon-Capt. C. H. L. Meyer, Dr. T. Blaney, Dr. N. N. Katrak, Dr. R. M. Kalapesi, Dr. D. R. Bardi, Dr. (Miss) Gertrude Bradley, Dr. (Miss) Benson, Dr. (Mrs.) Slater, Surgeon-Lieut.-Col. H. W. B. Boyd, Dr. Temulji Bhicaji Nariman, Surgeon-Capt. L. F. Childe, Surgeon-Capt. B. B. Grayfoot, Dr. J. T. Leon, Surgeon-Lieut. S. Evans, Surgeon-Lieut. L. W. Richards, Dr. F. Pearse, Dr. A. G. Viegas, Dr. L. P. DoRozario, and Surgeon-Capt. H. Herbert (*Honorary Secretary*).

Business :—

The President announced the election of Dr. R. M. Kalapesi and Dr. D. R. Bardi as members of the Society. Surgeon-Lieut. G. O. F. Sealy, Surgeon-Lieut. E. F. C. Baines, Surgeon-Lieut. C. H. S. Lincoln, and Surgeon-Lieut. J. L. Marjoribanks had joined under Rule IV. Surgeon-Colonel G. W. R. Hay and Brigade-Surgeon-Lieut.-Col. F. C. Barker had been elected by the Committee Vice-Presidents for 1898.

The following papers were read :—

1. Notes on three successful cases of Ovariectomy performed at the West Hospital, Rajkot, by Surgeon-Major W. H. Burke.
 2. Brief Notes on a case of Laryngitis following an inoculation with M. Haffkine's Plague Preventive Serum, by Dr. Thomas Blaney.
 3. Plague Experiences at Hubli by Surgeon-Capt. C. H. L. Meyer.
- Surgeon-Capt. Collis Barry agreed to defer showing his Skiagrams till the March meeting, owing to the lateness of the hour.

NOTES ON THREE SUCCESSFUL CASES OF OVARIOTOMY
PERFORMED AT THE WEST HOSPITAL, RAJKOT.

BY SURGEON-MAJOR W. H. BURKE, B.A., M.B., B. CH., &c.,
AGENCY-SURGEON, KATHIAWAR.

CASE No. 1.

Gulal Nagji, aged 30, admitted to the West Hospital, October 4th, in great distress, stated she had been tapped last February.

Circumference of abdomen at umbilicus 40", two inches above umbilicus 39½", two inches below 38¾".

As she was in great distress, and I had not everything quite ready for an ovariectomy (I wished for more silkworm gut sutures) I tapped her and drew off 538 oz. of blood-stained fluid.

Five days subsequently the patient was brought into the operating theatre, brought under the influence of anæsthetic (A. C. E.). The abdomen was washed with 1 in 2,000 H. P. lotion, with alcohol, and again with H. P. lotion. She had previously been given a phenyle bath. The patient was then placed in the Trendelenberg position and an incision was made extending from the umbilicus to a point 1" above the pubis. The cyst wall was found to be firmly adherent to the abdominal parietes, and was separated by the hand. There were a number of smaller cysts, some containing clear, some bloody fluid. Both ovaries were found to be diseased, and the tumours, which sprung from both ovaries, were blended; the solid mass removed weighed nearly 1½ lbs. The left pedicle was a small one and was easily secured by a triple-loop silkworm gut ligature. The right pedicle was broader, and the right ovary presented a very disintegrated caseous appearance, and broke down during removal; the broad ligament was secured by two knots tied as above, and the round ligament was separately dealt with, tied in two places, and divided between. Practically no blood was lost during the operation, but the rupture of a sanguineous cyst and the escape of its contents necessitated the washing out of the abdominal cavity with hot saline solution 0·6%: the fluid was sponged up by boric wool sponges—boric wool covered with sal alembroth gauze. The cut peritoneum and the muscles were brought into apposition by means of interrupted silkworm gut sutures

the skin was sutured by a continued silk suture. The wound was painted with iodo-collodion, and sal alembroth gauze was sealed down over this with collodion ; boric wool and a bandage applied. The patient took the anæsthetic well but required two digitalis and æther injections. October 14th : Wound dressed, united. October 19th : Wound dressed and stitches removed. November 15th : Patient discharged from Hospital, cured.

CASE No. 2.

Amba Purshotam, aged 43, admitted to the West Hospital, November 4th, with a large abdominal tumour. Married 30 years, husband died 7 years ago. Menstruation irregular for a long time ; has ceased for the last 4 months. The swelling is stated to have commenced over the left ovary ; circumferential measurement 1" above umbilicus, $32\frac{1}{2}$ ".

The patient having been prepared as in case No 1, thrown into the Trendelenberg position, and brought under the influence of an anæsthetic (A. C. E.), an incision was made in the usual position, the tumour tapped with a Spencer Wells' trochar and turned out. It proved to be a unilocular cyst with no adhesions, springing from the left ovary and containing 9 pints and 12 ozs. of clear fluid. The pedicle was about $1\frac{1}{2}$ " thick and was secured by a triple silkworm gut suture. There was practically no hæmorrhage during the whole operation. The peritoneum, muscles and skin were sutured separately ; the two former by silkworm gut, the skin by silk. The wound was treated in exactly the same way as case No. 1. The length of the cyst from pedicle to fundus was $10\frac{1}{3}$ ".

On November 20th the wound was dressed and the sutures removed, and after this it was left open.

On December 7th patient left the West Hospital, perfectly well.

CASE No. 3.

Dahi Ghella, aged 25, admitted to the West Hospital, November 8th, operated on November 12th. This patient's illness was of 8 years' duration. She had been tapped 20 times ! Menstruation ceased 8 years ago. General health fair : circumferential measurement of abdomen at umbilicus 36", above (at broadest part) $37\frac{1}{2}$ ", below $34\frac{1}{2}$ ".

The patient having been prepared as in cases 1 and 2, the sac was exposed by the usual incision through the linea alba and the hand introduced between the sac and peritoneum, so as to free the adhesions which were present over almost the whole of the anterior surface of the tumour, and in the middle line where the repeated tapplings had taken place the adhesions had to be separated by scissors. The cyst was next tapped by Spencer Wells' trochar, and 294 ozs. of thick, purulent fluid evacuated: the cyst was then turned out, and with it, and springing from the left ovary, were found nine smaller cysts. The thick cord-like pedicle, which contained two enlarged arteries (separately ligatured), was secured by a silkworm gut suture tied as in the previous cases, but the adherent broad ligament gave much trouble, and from this, as well as from the parietal adhesions above alluded to, there was very free and troublesome hæmorrhage. The abdominal cavity was washed out with saline solution, as in case No. 1, and the wound closed and dressed as in the other cases.

The anæsthetic used was A. C. E. A hypodermic injection of æther and digitalis was given and a brandy enema.

The wound was dressed on the 21st November and once subsequently only.

Patient left the Hospital perfectly well on the 12th December.

In all these operations I had the able assistance of Assistant-Surgeon Bocarro, and the cases were ably nursed by Miss Goldney, the Lady Superintendent.

REMARKS.

Each of these cases presents features of interest.

No. 2 was a unilocular cyst without adhesions; this case resembles those most usually met with in these days in Europe.

In No. 1 there were very extensive adhesions, and in No. 3 there were also adhesions, and the fluid in the cyst in this case was purulent, while there was also considerable hæmorrhage.

In Nos. 1 and 3 the abdominal cavity was flushed with hot saline solution.

I should like to draw the attention of the meeting to the following points:—

I. The Trendelenberg position.

The great advantage of operating with the patient in this position must be manifest to those who have operated on these cases in the old horizontal position, where, besides the inconvenience caused by the frequent protrusion of the intestines, there was the increased risk caused to the patient by the introduction of one or two pairs of hands into the pelvis to stay this protrusion. In these operations mine were the only hands in the pelvis throughout the operation, though the tumours were of course held by an assistant outside the pelvis during the ligature of the pedicles. Patients also take the anæsthetic better in this position.

II. The advantage of silkworm gut as a ligature, and of the form of knot I used for securing the pedicle.

III. The mode of sealing the wound by iodo-collodion and sal alem-broth gauze sealed down over this, by applying collodion over the edges of the gauze with a camel's hair brush. No. 2 had only one dressing, and Nos. 1 and 3 only two ; all three wounds healed by first intention.

IV. It is hardly necessary to say that all the most rigid antiseptic precautions were taken by me and my assistants, including the washing of the patient's abdomens with alcohol.

THE PRESIDENT thanked Surgeon-Major Burke for his interesting communication.

BRIEF NOTES ON A CASE OF LARYNGITIS FOLLOWING
AN INOCULATION WITH M. HAFFKINE'S PLAGUE
PREVENTIVE SERUM.

BY DR. THOMAS BLANEY.

A Khoja lad, aged twelve years, was, on Jan. 11, taken by his grandmother to His Highness Aga Khan's bungalow, at Mazagon, to be inoculated with M. Haffkine's plague preventive serum. He was then in good health. The operation was duly performed on the outer aspect of the left arm, and he returned to his house in Palki

Mohola. On the three following days he was confined to bed with fever. After the fever left him he still remained in bed and complained of his throat. His father took no notice of this complaint believing he would soon be quite well. In the interval the swelling due to the inoculation subsided, a slight cough appeared, and the throat was still complained of. On Jan. 20, or nine days after the inoculation, some difficulty in breathing occurred. This alarmed his father, and Dr. A. G. Viegas was sent for about noon. Dr. Viegas is present to tell what he knows about the case. About 1:30 the same afternoon I was sent for and saw the patient at 2 p.m. He was then in this condition: Lying in bed on his back with the eyes closed, tossing about, breathing loudly and quickly and with extreme difficulty. Evidently the glottis was the seat of spasm of a persistent character. The surface was cold and clammy and the pulse barely perceptible. I was able to ascertain that the fauces were injected and the uvula relaxed and enlarged. There was no evidence of membranous or of any exudation, nor was there any tumefaction or swelling round the throat externally. The lungs were examined and nothing abnormal was discovered.

The case was urgent, and the immediate indication appeared to be to relieve the breathing at once by operative interference. The house was loaded with dust from top to bottom, from incense cleaning that was being carried on on the ground floor. The Jamsetjee Jeejeebhoy Hospital was near at hand, and I thought the best chance for the patient was to hurry him away to that hospital, and advised that this should be done. The father promised to carry out my advice, and I left, feeling sure it would be carried out. I learned the next day that the lad had not been removed to the hospital, when I went to the house unsolicited to learn what I could. When I got there I was fortunate in finding Dr. Hatch in consultation with Dr. Viegas examining the patient. The urgent dyspnoea had passed away, and the lad was decidedly better, able to sit up and to answer questions. The case passed into the hands of Dr. Viegas and my visits ceased. My brief history of the case terminates abruptly here, and I now submit my paper for the collective opinion and judgment of the meeting on the chief point of interest, *viz.*, whether the previous inoculation with the plague preventive serum exercised any influence in exciting the laryngeal attack, or whether that attack was idiopathic and accidental.

I may say that I carefully considered the manifest throat symptoms at the time when I saw the case, as to the sufficiency of the throat conditions to provoke the laryngeal attack. The conclusion I arrived at is that the existing slight catarrhal and equanched conditions were insufficient to explain that attack.

DR. VIEGAS said that he had not much to add to what had been said by Dr. Blaney about the case. He saw the boy about noon on Jan. 20, and found him in a very restless condition. The breathing was difficult and attended with noise, and the patient was tossing about on his bed. The symptoms were urgent, and he thought that operative interference would probably be necessary and advised them to call in Dr. Hatch or take the boy to the J. J. Hospital, which was very near to the patient's house. They neither called Dr. Hatch nor had the boy removed to the Hospital. The next day he asked Dr. Hatch to see the case in consultation with him, and they found the boy's breathing and general condition was better than the day before. Dr. Blaney, who had seen the boy the day before, was also present at the time. He was treated, Dr. Viegas was informed, for two days previous to his first visit to the patient, by Dr. Quadros for the complaint; the parents took the boy to him in preference to Dr. Viegas as he had inoculated him against plague. The points of interest in the case were that the attack came on gradually and passed away without operative interference, although the patient seemed to be on the very verge of death.

The PRESIDENT saw no definite connection between the inoculation and the throat attack. The latter had probably some distinct origin, as the fever due to the inoculation had subsided.

SURGEON-COLONEL HAY asked whether the very irritating dust from the cleaning of incense were not quite sufficient to account for the throat symptoms.

DR. PEARSE said that one had to decide whether the attack had been catarrhal, paralytic, or spasmodic. It was apparently not acute oedema, and the time had been too short for paralysis; hence probably spasmodic. It probably was not due in any way to M. Haffkine's prophylactic, since the time intervening had been long, and there was no analogous throat affection in plague itself, either in the attack or during convalescence.

DR. KALAPESI remarked that he had known personally of some thousand inoculations, in none of which had any laryngitis occurred.

SURGN.-MAJOR MONKS asked whether the patient might not have simply caught cold ; he had seen similar cases, especially under the influence of change of climate. He considered that it was probably a case of œdema of the glottis, as there were signs of inflammation of the throat ; but the laryngoscope was necessary for correct diagnosis.

DR. BLANEY replied that the room the patient occupied was an ordinary but a fairly good room in a native house, and not particularly exposed to draughts, but, as was stated in the paper, the air of the room was loaded with dust arising from the cleaning of incense. This dust might give rise to and keep up an irritation in the fauces. The patient had catarrhal symptoms, and the uvula was relaxed, elongated, and slightly swollen.

PLAGUE OPERATIONS AT HUBLI, WITH REMARKS ON PLAGUE.

BY SURGEON-CAPTAIN C. H. L. MEYER, M.D., I.M.S.

MR. PRESIDENT AND GENTLEMEN,—I thought a paper on plague operations at Hubli would prove acceptable to the Society, as the measures adopted there were attended with some success. I also wish to add a few observations on some conclusions I have been able to come to about plague, and the method of dealing with it in the mofussil.

On my arrival at Hubli, on the 27th of October 1897, I found that a sharp outbreak of the disease had occurred in a block of Railway chawls (*vide* Plan I A) occupied by employés of the S. M. Railway Company.

The sanitary conditions of these chawls were extremely bad. They were situated in a hollow which was surrounded by high ground on all sides, causing the wind from any quarter to pass over the buildings ; “external” ventilation therefore was very unsatisfactory. The block consisted of single-storied buildings occupying an area of about 4 acres, and housed 1,200 people in 350 tenements. These tenements were closely aggregated together and attached to each other, and they were

provided with walled-up verandahs which assisted effectually in keeping fresh air out of the houses. A few small windows were placed low in the walls, in such positions that the inhabitants could easily satisfy their natural propensity for hermetically sealing them up.

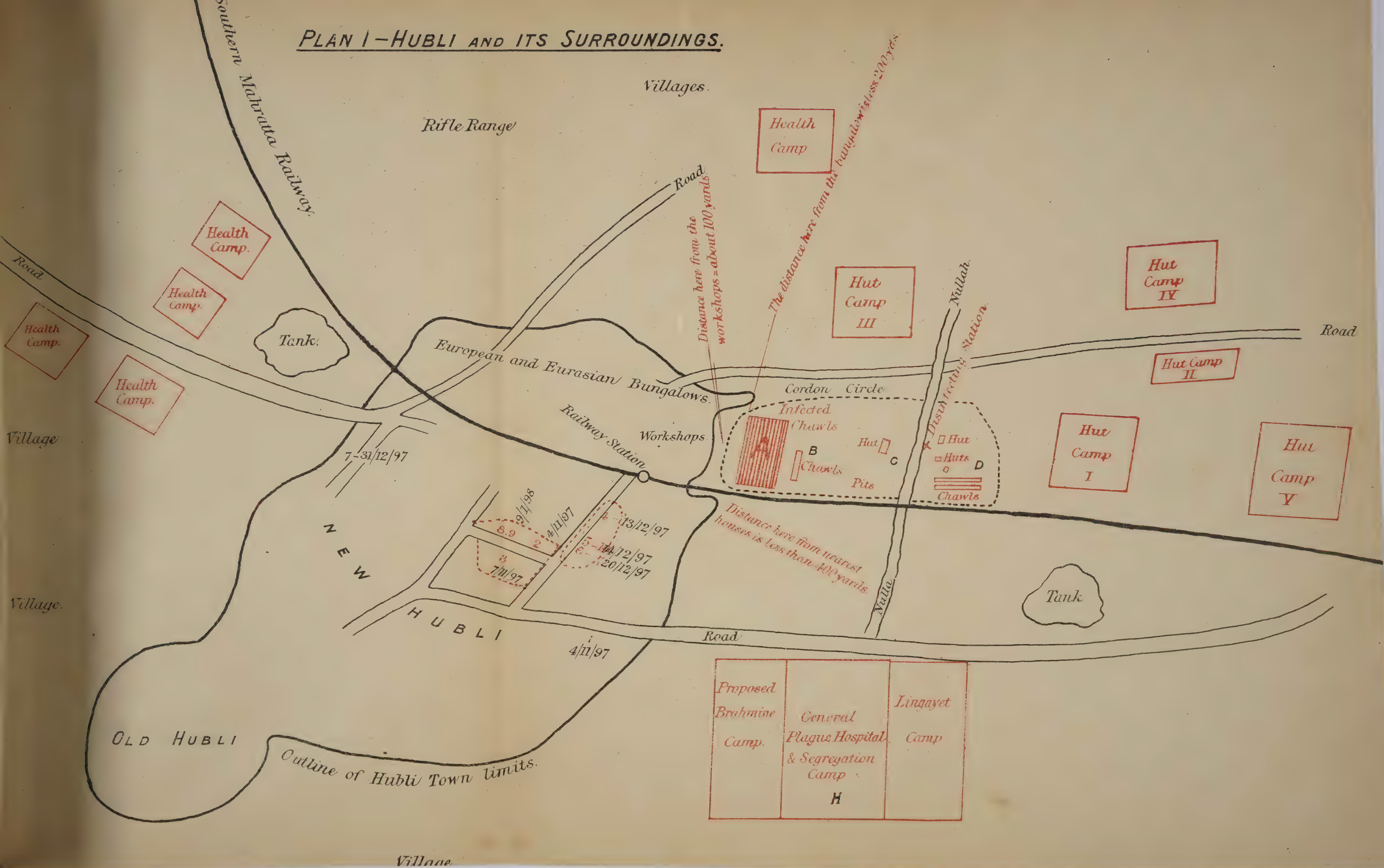
The subsoil water, whose level was naturally high in the cup in which the chawls lay, was found on analysis by Surgeon-Captain Collis Barry, Chemical Analyser to Government, to be contaminated and unfit for drinking purposes. This was only to be expected, for soakage of foul matter into the ground water was taking place from dwelling-houses to the north and from refuse and excreta pits and cultivated lands to the north-east, and east. I have said enough now to show that the sanitary conditions, especially as regards ventilation and overcrowding, were most unsatisfactory. I made these matters the subject of a special report, in which I strongly urged the S. M. Ry. Company to raze the chawls to the ground and not to think of restoring them on their present site. Railway employes returning from leave early in October from Poona, Bombay, Sholapore and other places in the north brought infection with them into the chawls. From all the evidence and information I could collect, I came to the conclusion that the first case of plague appeared about October 10th. From this date up to October 17th there were two deaths ascribed to fever, but undoubtedly in my opinion, due to plague. The disease was first recognised on October 17th. Up to the time of my arrival, on the 27th, there had been seven cases with five deaths. It is thus seen that the first imported cases passed unrecognised, and I came to the conclusion, on my arrival and after seeing also the unsatisfactory sanitary conditions of the chawls, that the locality was deeply and dangerously infected, that indigenous cases were already appearing, and that it was imperative, in order to avoid great loss of life, to clear out the inhabitants as speedily as possible. The other problems that lay before me were the following :—It was in the first place absolutely necessary to do all in one's power to limit and confine the outbreak to the chawls and prevent its spread from thence. Next, every effort was to be made to stamp and blot out this outbreak, the only plague spot in the whole of the large Dharwar District with its millions of inhabitants.

The measures that were adopted were as follows :—

A strong police cordon was drawn around the block of chawls so as to prevent the escape of any of the inhabitants, and also the entrance of any outsiders. Some mud and bamboo

huts in the neighbourhood (*vide* Plan I, B C D) were included within the cordon because of their proximity and of the fact that the people occupying them used the same latrines and water-supply as the inhabitants of the chawls, and were constantly in free communication with them. In the next place, on the day after my arrival, I impressed all the aid available and had a complete census made of all the people within the cordon. This was important as it enabled us to carry out our daily inspection to a roll-call at each house, and thus not a single person could escape daily examination by the inspecting doctor, and we were also provided by the census with detailed information about each person, which would be extremely valuable to the police in the case of any escape revealed by the daily roll-call. Several people did, during the first week or two, steal away at night through the cordon, but, armed with our census information, most of them were soon recaptured by the police, and the practice was given up. Those we could not recapture had certainly left the Dharwar District or, perhaps, disappeared into the *Ewigkeit* of Hans Breitmann. As said, it was imperative to move the people out of the chawls as soon as possible. This I should have done at once, as every day's delay meant a loss of life, by turning the people into the fields and letting them live under temporary shelters, were it not that the very cold nights prevailing at Hubli at the season of the year made this impossible. Two Hut Camps (I and II, *vide* Plan I,) were rapidly erected, and all the people of the chawls were transferred into them, *viz.*, Europeans, Eurasians and higher caste natives, occupying better built quarters and numbering about 300, into Hut Camp II; the remaining 900 into Hut Camp I. The people living in the most deeply infected quarters were the first to be removed, and so on in order to the least dangerous, until the whole block was completely emptied. The people and all their effects were disinfected on their transfer from the chawls to the Hut Camps as thoroughly as it was possible to carry out such measures, a line of police preventing any one passing across except through the disinfecting station (*vide* Plan I +). Since all experience has certainly taught that the infected house is one of the most dangerous elements in plague, the doors of the evacuated tenements were immediately locked up. I soon discovered, however, that a few of the people were opening the locks at night and sleeping in the houses, which they found much warmer, I acknowledge, than our bamboo matting huts. I therefore got the Railway Company to screw up the doors, thus effectually preventing any entry. After the

PL
Southern Malabar Railway.





infected quarters were closed they were immediately unroofed, the tiles being carried away and thrown into pits near the Railway line (*vide* Plan I). The old bamboos and matting beneath the tiles of the roofs were broken up and thrown down into the houses, where they were afterwards burnt. The people occupying the other chawls and huts in the neighbourhood (*vide* Plan I, B C D) were also turned out into Hut Camp I, and their quarters being of a very poor and cheap description, were burnt and razed to the ground. During the evacuation of the various chawls numerous plague rats were discovered. Fortunately these rats travelled from the large block of Chawls A to the east, not to the north and south-east, where they would undoubtedly have infected the parts of the town lying a very short distance away. All plague rats discovered were cremated. After the transfer of the people a good number of cases continued to appear in Hut Camp I, among Punjabis and Madrasis. A third camp (Hut Camp III, *vide* Plan I) was therefore run up rapidly, into which these people were moved. We thus got rid of the most dangerous elements of Hut Camp I, and reduced the size of the camp itself, a most desirable step. After this move there remained in Hut Camp I a population, about half of whom were engaged in the dismantling and disinfection work in the infected chawls. The other half consisted of some Gujeratis and Panjabi Mahomedans, castes who would not consent to do disinfection work. These people who had remained very healthy, were consequently shut up in a camp with the workers in the chawls, and since the latter were by the nature of their employment exposed to considerable risk of infection, it was thought advisable to erect another camp (Hut Camp IV, Plan I) and to move into it the non-workers. This was done, and thus the healthiest elements of Hut Camp I were now removed and the camp still further reduced in size. Lastly, we had a fifth camp built (Hut Camp V, Plan I) and moved into it all the remaining inhabitants of Hut Camp I as soon as all work in the infected chawls was finished, *viz.*, at the end of December. This step I considered advisable, as there may have been a certain amount of local infection of Hut Camp I (over twenty cases had occurred in it), and further it was an old long-standing camp, and its site and surroundings had consequently suffered sanitarily. Hut Camp I after evacuation was burnt to the ground.

The steps taken in disinfecting the chawls were as follows :—As already said, the first measure after evacuation was the closing (screw-

ing) up of the doors, so that none could enter the infected houses. The tiles were removed at the same time, and all the combustible materials in the roofs, *viz.*, matting, bamboos, and smaller timbers, were torn off and thrown down into the houses, where, after the addition of some kerosine oil, they were burnt. The heat produced by this combustion was so great that it was impossible to enter the houses for some hours after the fire had died out. We must have here had a valuable means of destroying plague poison. The next step taken was to thoroughly drench the whole interior surface of the house with 1 in 1,000 perchloride of mercury solution, special attention being paid to cracks, crevices, rat-holes and drains, and care being taken that not a spot of surface escaped the action of the disinfectant. Lastly, the interior was thoroughly whitewashed with a very thick limewash to which a considerable quantity of bleaching powder was added. Disinfection of the surroundings of the houses was also carried out, *e.g.*, all rubbish lying about was collected and burnt, and drains, gutters, and latrines were thoroughly attended to. All that remains of the infected chawls now are the walls and a few of the heavier timbers of the roofs. In view of the insolubility of perchloride of mercury, we always prepared our disinfectant overnight, adding sodium chloride to assist solution. During the working hours of the day the cordon circle of Hut Camp I was extended so as to include the chawls; in the evening, when work was over, it was contracted again so as to shut out the infected quarters which, however, were still kept guarded at night in order to exclude any outside people coming from the town. The belongings of the people in the Hut Camps were subjected to repeated disinfection. Old cotton quilts, dirty pillows and mattresses and rags were taken from them and burnt, new blankets being given in exchange. In this way over 500 blankets were distributed. The Railway Company paid all their workmen who were shut up in the camps a subsistence allowance. This cost them about Rs. 200 to Rs. 300 per diem, and they were continually clamouring and requesting that their men should be allowed to go to their work in the workshops. The policy adopted with regard to the camps was as follows: Any camp, the people of which remained free of plague for 12 days, was placed under "partial" cordon, that is to say, the men in that camp were allowed to go during the day to their work in the railway workshops, the women and children remaining in the camp. In the evening, on the return of the men from work, a medical inspection was carried out. All the inhabitants of the

camp under partial cordon were required to sleep in the camp, and they were not allowed to remove any of their effects from it. All outsiders also were still kept out. Hut Camp II was the first to be placed under partial cordon, then followed Hut Camps III and IV in order. Hut Camp V was kept under strict cordon for a period of 12 days after the completion of the work of its inhabitants in the infected quarters. At the end of this period (January 10th, 1898) I declared all the Hut Camps free of plague and uninfected, and placed them and their inhabitants on the same footing as regards plague measures as the rest of the town of Hubli. This closed the episode of the outbreak in the Railway chawls. The last case of plague in the Hut Camps occurred on December 13th, and up to the date of writing, January 30th, 1898, there have been no further cases. In fact the people of the camps form now the healthiest section of the population of the town.

The number of deaths from plague which occurred in the 1,200 people who lived in the infected chawls was 35, *i.e.*, about $\frac{1}{35}$ th of the population. Nine of these deaths occurred in the chawls before removal; 15 occurred in the chawls and huts during removal, and the remaining 11 in the huts after removal. One-thirty-fifth of the population is a very small fraction for plague mortality, especially in such a very insanitary condition as, I feel sure, existed in the chawls, and the fraction would have been much smaller if the climatic conditions had allowed of the people being turned out at once into the fields. To appreciate fairly the value of the measures which were taken, one should draw a comparison between the plague mortality in such a case as the above, where the people were compulsorily moved out of the infected quarters, and the death-rate in an instance such as that of the village of Karad in the Satara District, where this was not done. Karad had a population of 12,000, of whom, I am informed, between 2,000 and 3,000, *i.e.*, about $\frac{1}{5}$ th died of plague. It must be remembered, too, that after some hundreds of people had died in Karad, many of the inhabitants ran away to other villages, thus reducing the total population of the place. Thus, the fraction $\frac{1}{5}$ th is too low. Compare them now: the fractions $\frac{1}{35}$ and $\frac{1}{5}$, and I think there can be no doubt as to the lesson which can be learnt. This lesson has been long taken to heart by the Himalayan villagers, who clear out into the jungles as soon as *mahamari* or plague appears in their villages.

Hubli consists of two towns, old and new (*vide* Plan I), with a total population of about 50,000. It lies on a slope inclining S. and S. W.

Surface drainage is good, the subsoil water-level low, and sanitation generally excellent for a native town of its size and class. It was necessary to make some arrangement at once for the discovery of any appearance of plague in the city. Infected people might escape from the chawls at any time into the town and elude discovery by the police. Rats again might travel from the chawls into the town and infect it. Infective matter from the chawls might at any time be conveyed into the town, and lastly, there was the continual danger of cases of plague being imported from Poona, Belgaum, Sholapur and other infected areas in the north. A scheme, known as the Supervision Scheme, was devised for the purpose of securing a correct notification of every case of death, sickness, and new arrival in the town. The scheme was as follows: Hubli contains about 12,000 houses. One hundred and twenty Supervisors were appointed, and to each was allotted a district containing about 100 houses. Each Supervisor had to take a correct and complete census of every house in his district. He had to inspect each house daily and notify at once any deaths, any cases of sickness, or any new arrivals. Over the Supervisors were placed ten Superintendents, who themselves were under the authority of a Chief Superintendent. The Supervisors were, in part, specially engaged men, in part karkuns and assistant schoolmasters in Government employ. The Superintendents were volunteers from the ranks of the Municipal Corporation and the local European community. I deputed to one of the Hospital Assistants of the Flying Column the duty of proceeding to inspect the corpse in every case of death, as soon as possible after it was reported by the Supervisor in whose district it had occurred. To the Hospital Assistant were given the most stringent instructions that, should he have the faintest doubt after thorough investigation as to the cause of death, he should immediately report to me for my opinion. Cases of sickness reported were in the first instance to be inspected by the Assistant Surgeon of the Flying Column, and two local practitioners, to each of whom about $\frac{1}{3}$ rd of the town was allotted as a district, and they were to refer to me if in the slightest doubt. Police and Supervisors were also placed at all the burial and burning grounds (about 18 in number) and they had orders not to allow of the disposal of any body without a death certificate from a medical or plague authority. New arrivals, especially if they came from infected areas, were kept under observation for a period of 12 days. A weekly death report, ending Sunday midnight, was drawn up independently, first by the Hospital Assistant from a diary he kept of the

corpses he had inspected ; second, by the Police and Supervisors at the burial and burning grounds ; and third, by the Chief Superintendent from the reports of his Superintendents and Supervisors. These three registers checked each other and at once exposed any error, enabling one to localise it and discover the culprit. With such a check system we obtained accurate information in the case of deaths. As regards sickness and new arrivals, not having the same principle at work, we did not get the same result, and as a consequence did not discover several of the plague cases which appeared in the town until they had proved fatal. Something, however, might be done in this direction in the case of new arrivals, by getting the railway officials and the road police at the Octroi chowkies to notify all new arrivals by rail and road. Armed with a microscope and immersion lens, and also with means for cultivating the plague bacillus, I was able, in cases about which there was any doubt, to decide on *post-mortem* examination whether the cases were plague or not. Two of the nine cases that occurred in the town were non-bubonic, and it would have been quite impossible to have come to a certain decision about them without a microscope, for the patients in each case suffered only from a severe remittent type of fever. In the case of a living patient with doubtful illness, if the microscope could not help one, *e. g.*, when there was no bubo or sputum (the blood, it must be remembered, is of little value for the discovery of the plague bacillus till late in the disease), the patient was taken into the observation ward of the Plague Hospital Camp. Nine cases of plague occurred in the town up to January 12th, the date on which I handed over charge of plague matters at Hubli. On referring to Plan I, the localities and dates of the cases will be at once apparent. Of these Nos. 1, 2, 3, 5, 6 and 7 were undoubtedly proved to be "imported," *i.e.*, to have contracted infection outside Hubli. In the case of No. 4, it was impossible to come to a certain decision as to whether the infection was imported or locally contracted in the town. In my own opinion the case was an imported one. The last two cases, 8 and 9, were apparently indigenous, there being no evidence of importation.

Looking now at Plan I, it will be observed that most of the cases in the town appeared in much the same neighbourhood, and one is led to suspect that this locality had become slightly infected. Against this supposition, however, there are certain facts which must be borne in mind : (a) The distances between most of the cases are considerable, the plan of the town being drawn on a very small scale. If the locality

were infected, one would have expected a closer aggregation of the cases. (b) The time intervals between, at any rate, the first two cases and the remainder are too great for any casual relation between the two groups. (c) In three only of the cases is there any doubt at all that infection was contracted at some source outside the town. (d) Imported cases would naturally appear in the neighbourhood where they actually occurred, for this quarter holds the most moving part of the population of the town. Cases 8 and 9, however, as stated, showed no evidence of being imported, and so it was considered advisable to be on the safe side and to assume that the localities in which the cases had grouped themselves were infected. Acting on this assumption, it was decided to clear out the population of the houses in these parts. On referring to Plan I, the dotted lines will show at once the neighbourhoods which were emptied. This measure may appear somewhat severe and unnecessary, but we recognised that in plague operations it was most important to keep ahead of the disease and not to let it get ahead of us. The people who were turned out were located in the Health Camps to the west (*vide* Plan I) which had been got in readiness to meet such an emergency. All the parts of the town fringing the evacuated and dangerous quarters were thoroughly searched daily.

Every house in the town in which a case occurred was completely unroofed and disinfected thoroughly. In one case, where it was possible to do so without setting fire to the neighbourhood, the house was burnt down.

The surroundings of these infected houses and the neighbouring latrines were also attended to, every effort being made to completely destroy the plague poison at the seat of importation. Only the bare whitewashed walls of these houses are now left.

The last case in the town occurred on January 9th, and, up to the moment of writing (January 30th), there has been no further case in it. We were obliged to fix upon cultivated land as the site of our Plague Hospital and Segregation Camp, for there is no virgin soil available around Hubli, the land being under cultivation everywhere. A field, about 500 yards long by 300 broad, was chosen in the situation shown on Plans I and III, and the green jowari crop standing on it was cut down. The site lay about a quarter of a mile to the east of the town and about a third of a mile to the south of the infected chawls. The

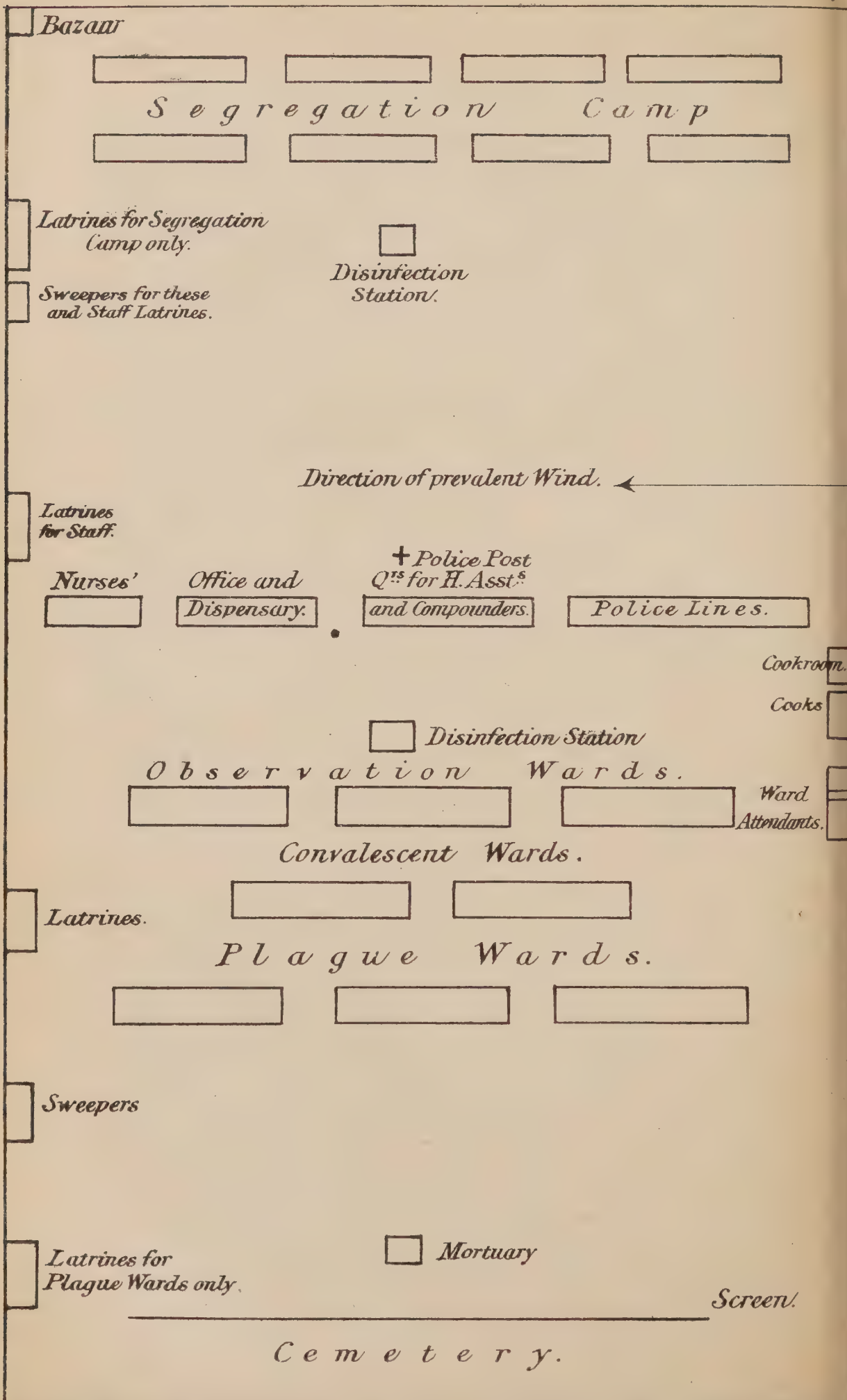


PLAN OF PLAGUE HOSPITAL AND SEGREGATION CAMP.

X

PLAN II.

X
A



E
X

B

X

XXX = Police guards.

principles on which it was arranged were as follows :—(Plan II) A B C D represents the whole camp unit ; it is divided into two halves by an imaginary line E F. E B C F is the more infected and A E F D the less infected half, the degree of infection and danger increasing gradually in the whole camp as one passes from the line A B towards the line B C. In the Segregation Camp sheds are placed dividing the healthy from infected houses. These people, when paupers, received a daily money allowance, and made their own arrangements for food by purchasing from the bazaar near A. They had also their own latrines and sweepers, and formed a community independent and separate in every respect from the inhabitants of the other half (E B C F) of the camp, from whom, moreover, they were kept very strictly apart. Three police posts were placed along the line E F to effect this object, and it was further secured by arranging the quarters of the resident staff along the same line. The inmates of E B C F formed also a distinct community independent in all arrangements of the people of the half A E F D. Here (in E B C F) everyone was put on hospital diet.

Anyone passing into or out of either half of the Camp had to first submit to disinfection at the disinfection station of that half. Persons discharged from the most infected half E B C F were obliged, after disinfection, to remain at least 10 days in the other Segregation half. On leaving the latter, they were again disinfected, and were then sent for a further period of 10 days to one of the Health Camps (*vide* Plan I), where they were given greater freedom, but were still kept under observation. This was done because it was thought one could not exercise too great care in trying to prevent any infection being carried to the outside from our Plague Hospital Camp. The observation wards were for patients suspected of having plague, but about whom no positive opinion was possible. No patient was ever admitted into the plague wards unless it was certain that he was suffering from plague. This arrangement, together of Plague Hospital and Segregation Camp in one unit, is advisable ; first, they should be near each other, for frequent transfers have to be made from one to the other ; second, from the point of view of economy the arrangement is good, for one medical and police staff suffices for the supervision of both camps. As many different Plague Hospital and Segregation Camp units for different castes and similar to the above could be arranged side by side, slight alterations only would be necessary in the position of the latrines. The Camp was arranged so that the

prevailing wind blew across it, as shown in Plan II. There was then less risk of fire, and external ventilation was more efficient. The huts in the Camp were constructed of bamboos and date or bamboo matting, the interiors being lepoed and whitewashed and the walls covered, on account of the cold at night, with a thick layer of jowari stalks on the outside. The hut blocks were small because of the risk of fire, and also because a block might at any time become infected and require destruction. The ward buildings were of superior construction to those of the rest of the Camp.

Before proceeding to remark on plague itself, I should like to lay before the Society a plan of measures which are of advantage in attempting to stem the spread of plague in the mofussil, and keep it out of any district or collectorate. Most of these measures, if not all, are already in force in the Dharwar District, and in putting them before you I do not claim them all as original ideas of my own. One of the ways in which plague is introduced into a district, is by the railway native passenger traffic. To meet this danger detention camps should be instituted at the first station in the district on every railway line leading into it from infected areas; only passengers intending to alight and remain in the district are detained in the camps, where they should be kept for a period of 12 days. Passengers passing through are not detained, but are dealt with in the district to which they may be going. At the detention camps every passenger and all his belongings should be well disinfected, dry steam or steam-at-pressure disinfection being employed if possible for the latter. If combined with the above one has strict medical inspection of all passengers at the chief stations in the district, one will possess a scheme which will fairly well check the introduction of plague by railway passenger traffic. Another great danger, and this is perhaps the most frequent method of introduction of plague into a district, exists in the movements of native railway employés. They are constantly being transferred along the line, frequently from infected to uninfected stations and towns. On arrival at any new station there are usually no restrictions to their movements or places of residence when off duty. The following measures are advisable in dealing with this danger:—The railway authorities could, by a slight re-arrangement of their usual methods of working, greatly lessen the number of transfers from station to station, and thus diminish the movements of their employé population. Further, they should be made to keep their staff stationary at any infected

place ; at any rate they should not be allowed to move them from such to an uninfected area. Another step would be advisable, *viz.*, to get the railways to house all their employés within railway limits at every station, not allowing them to live in the town or village. With such an arrangement a case of plague would only infect the small railway population, and it might still be possible to keep the town free. Lastly, there is another danger to a district in the large population moving by road and jungle path into it from the outside and about it from village to village, for the purposes of trade. It appears to me that one can do a great deal to meet this danger by keeping this moving trade population out of the villages. Every town and village in the district should possess a health camp about a quarter or half a mile away from itself, and of a size proportionate to that of the particular town or village. Traders and travellers presenting themselves at a village would be directed to betake themselves and their effects to this camp. Villagers, in my experience, are only too anxious, if plague be approaching, to keep all newcomers out of their village. What usually happens is that travellers arriving at a village ask to be taken in and given accommodation. This is refused, but the traveller gets his way by persisting and often is able to show a pass (and great is the power of the written word with the villagers), which he assures the Patell is a guarantee of his safety, or, he may even assert, is an order for his admission. If there be a health camp at the village, the traveller can be directed thither, and there is no further difficulty. My idea is, therefore, that this trading and travelling population in a district should move from health camp to health camp in its wanderings, and should not enter the villages. Should a case of plague appear in a health camp (constructed of light materials, *e. g.*, bamboos and matting and situated on a pure soil) no harm is done, for such a camp, unless very old and insanitary, is not easily infected. It is when a case appears in a village, with its soil fouled through centuries with animal organic matter, and with its badly-ventilated houses and huts, that plague at once takes a firm hold and infects the locality. In addition to the above one could have detention camps on the main roads entering the district from the infected direction, but these would, I am sure, be soon avoided by travellers. The system of issuing passes is most unsatisfactory. In the first place no medical man can guarantee any person to be free of plague, *e. g.*, in the incubation stage, or that he does not carry infection about him. Again, in issuing a pass one often has to depend largely on the applicant's own statements as to where he came from. And

lastly, a pass often does positive harm, not only by securing, as stated above, a man's admission into a village, where he is not safe, but the same pass is often handed on and made use of by other persons.

Before closing I should like to make a few remarks about my clinical experiences of plague.

With regard to *symptoms* the only points to which I wish specially to draw attention are the following :—(a) The great effect which the toxins of the plague bacillus have on the muscular system ; the skeletal muscles are often quickly weakened and made irregular in their action, so that muscular weakness and ataxy (staggering gait) are common symptoms, often early in their appearance, and therefore of diagnostic value. These signs are in agreement with degenerative changes in the muscles, similar to those met with in typhoid fever, described by Surgeon-Captain Childe. (b) The rapid failure of the circulation, due chiefly, most probably, to the action of the toxins on the muscular fibre of the heart. Death is usually immediately due to this cause, the pulse quickly failing and acquiring a "running" character. (c) The tongue usually assumes one of two types : (1) If moist, it is thickly coated with a white fur and has a red tip and edges. (2) If dry, it is dark-brown and cracked. If the patient live long enough, (1) frequently passes into (2).

On the *pathology* of the disease I have a few remarks to make. Frequent examination of the blood has shown that the number of the white corpuscles in it increases as the fatal termination of the case approaches. This sign, therefore, is of prognostic value. Many of the leucocytes appear to be dead, and should therefore more properly be spoken of as pus corpuscles. Of the significance of this observation I can advance no opinion ; it seems as if the phagocytes, worsted in the tissues in their battle with the bacilli, retreated into the blood whither they are pursued by the bacilli, for the latter only appear in numbers, or at all, in the blood when this increase in the number of white corpuscles takes place in it. The observation will, I think, hold good on further enquiry.

The disease assumes many types. It may be mild or severe, and may have a duration of a few hours or a week or two. There may be a distinct disease-focus in the lymphatic glands anywhere in the body, or there may be no such recognizable centre. The focus may

develop early or late. Children, in my experience, seem to have a greater chance of recovery ; it may be owing to the more active and dominant state of their lymphatic functions.

The characters of the plague bacillus from a human culture, *e g.* the bipolar staining, show always extremely well, provided the germ is stained for exactly the right length of time. I have never failed to find the bacillus in the spleen in a fatal case, whatever the type assumed.

I have, up to the present, come to the conclusion that there is no specific drug *treatment* for plague. From what has been said about symptoms, the most important matter, I think, to pay attention to the treatment, is the stimulation and maintenance of the action of the heart. A Dr. Wiggleworth, in a very able contribution in an October or November number of the *Lancet* of 1897, showed what wonderful control could be obtained over the germs of scarlet fever by strong carbolization of the patient, a child of 5 years being given as much as from 24 to 36 grains of carbolic acid in the 24 hours. His idea was that the carbolic acid, the only powerful disinfectant to which the body is at all tolerant, attenuated the scarlet fever germ in the body, and thus modified greatly the severity of its action.

One case in the Hubli Plague Hospital calls for a brief report. A Madrassi, aged about 20, of poor physique and very dark complexion, was admitted into the observation wards on the evening of November 14th, with a temperature of 102°F., but no other symptoms beyond the usual malaise accompanying a feverish attack. His fever had come on 3 to 4 hours before admission. The next morning he was found to have developed a small bubo in the right groin. He was placed under chloroform, and the bubonic gland, together with all surrounding lymphatic glands and connective tissue structures, was very freely excised. The edges of the large wound were not brought together, but it was packed with iodoform and dressed. The removed bubo revealed to microscopical examination swarms of plague bacilli. The patient improved greatly for a week after the operation, but then took a turn for the worse and died from exhaustion on December 2, nearly three weeks after the onset of his illness. A *post-mortem* was made, and thorough examination of spleen, liver and lymphatic glands showed that there were no plague bacilli in the body. These facts are noteworthy and encouraging, leading one to

think that *early* and *free* excision of *early* appearing buboes in bubonic cases might be attended with good results. Similar treatment at London Hospitals of cases of malignant pustule (anthrax) occurring in workers in foreign leather and wool has frequently, in my own experience, led to cure. Even if excision of the bubo (apparently a disease focus) does not remove all the bacilli in the patient's body, yet a measure which removes any poison at all must be sound. If it be possible and, if the condition of the patient allow of it, I should always recommend the excision of an *early* appearing focus in plague cases. In such it may be assumed that the great majority of the bacilli are gathered together in the focus, and consequently, even if by the excision of this we do not remove all the bacilli, yet the few that are left may succumb to the attacks of the body phagocytes, as appears to have been the case with the patient whose history I have reported.

In concluding, I must thank you for a patient hearing and state at the same time that I do not take credit to myself for having originated any new ideas in dealing with plague. Many of the steps which were taken were due to the initiative of the Collector of Dharwar, Mr. Cappel, one of Government's most able Civilian Officers. What success we gained I attribute, with all modesty, to an unrelenting supervision and constant attention to detail, and a desire to be thorough and accurate in our operations.

It was proposed by Brigade-Surgeon-Lieut.-Col. T. S. WEIR and carried, that the discussion on Plague experiences at Hubli may be deferred till next meeting and the paper on the disease may be printed and circulated amongst the members of the Society in the meantime.

The PRESIDENT felt that he could not allow the meeting to break up without stating his appreciation of the great value of Surgn.-Capt. Meyer's work in Hubli. Surgn.-Capt. Meyer had, in the President's opinion, demonstrated that the measures which had been taken comprised the proper method of dealing with plague, and formed a part of the only measures likely to prove successful in freeing a place from plague.

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE usual Monthly Meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, 11th March 1898, at 5-15 P.M.

President—Surgeon-Major-General G. Bainbridge, M.D., F.R.C.S.I., in the chair.

Present : Brigade-Surgeon-Lieut.-Col. F. C. Barker, Surgeon-Lieut.-Col. J. S. Wilkins, Surgeon-Lieut.-Col. J. W. Clarkson, Surgeon-Capt. B. B. Grayfoot, Surgeon-Capt. C. H. L. Meyer, Surgeon-Capt. G. S. Thomson, Surgeon-Capt. S. E. Prall, Surgeon-Lieut. S. Evans, Dr. R. M. Kalapesi, Dr. T. Blaney, Dr. N. N. Katrak, Dr. Temulji Bhicaji Nariman, Dr. R. D. Dalal, Dr. Sorab Nariman, Dr. F. Pearse, Dr. A. H. Dean, Dr. (Miss) Benson, Dr. F. G. Clemow, Dr. (Miss) Carthone, Dr. (Mrs.) Slater, Dr. D. R. Bardi, and Surgeon-Capt. H. Herbert.

Business :—

The President proposed, and Brigade-Surgeon-Lieut.-Col. C. F. Barker seconded the proposal, that Surgeon-Major-General P. S. Turnbull, M.D., Surgeon-Col. D. E. Hughes, and Brigade-Surgeon-Lieut.-Col. G. A. Maconachie, M.D., F.R.C.S., be appointed corresponding members of the Society, which was unanimously carried.

Surgeon-Capt. T. D. Collis Barry's skiagrams were exhibited, and the following paper was read, the discussion on both this paper and on Surgeon-Capt. Meyer's paper read at the last meeting being taken together.

PLAGUE EPIDEMIC IN SATARA CITY, 1897-98.

BY SURGEON-CAPTAIN G. S. THOMSON, OFFICIATING CIVIL
SURGEON, SATARA.

In this paper it is not my intention to go into everything about
Introduction. plague, or its clinical phenomena, except incidentally,
but to give a succinct account of the outbreak of
plague in Satara City, as distinguished from Satara Collectorate,
in 1897-98.

Plague is a want-of-fresh-air disease pre-eminently. Why that is so, in my opinion, will appear further, and especially in the remarks regarding those exempt and those attacked. Plague is the most fatal epidemic disease known to medical science; and it therefore behoves us, as members of that noble profession, to discover its causes and how to prevent its invasions. I the more readily firmly state my belief at the outset that it is a want-of-fresh-air disease, as I used to consider it a filth disease, and in my own mind termed it "filth fever." In doing so I erred in good company, as Galen and Hippocrates termed it filth disease (from Greek *λοιμής*=filth); but at that time I had only seen plague in its clinical aspects at Parel Hospital; and since then I have seen it in its haunts and where it is developed, and have read and studied it from every aspect for upwards of 14 months.

Satara is a city of (according to the census of 1891) 25,748 inhabitants, situated at an elevation of 2,320 feet, 70 miles
Description. south of Poona, and 10 miles from the Southern Mahratta Railway. In October 1897, when plague broke out, the population had increased to 29,153 souls, chiefly through refugees and fugitives from Bombay, Poona and the Satara district, where plague had been raging epidemically since April 1897, especially in Karad, a town of about 12,000 people, 24 miles south-east of Satara City. I was appointed Civil Surgeon of Satara in July 1897, and arrived there on 30th July. Up till that date there had been 11 imported and one suspected cases of plague—all fatal, except the one suspected case. It is to be noted that the imported cases had been detected at the observation posts, and had not actually gained admission into the city.

The organization in existence then was one camp of detention and observation and three observation posts, where people were medically examined twice daily, and all people without village passes, or coming from infected or doubtfully infected places, were detained under medical surveillance for a period of 10 days. All who failed to develop plague symptoms, and whose temperatures were normal, were passed into the city on the eleventh morning of detention and observation.

Passed-in lists were sent to the Municipality, giving full particulars of the incomers' residence in the city, and they were visited twice daily, and medically inspected during the house-to-house visitation then in operation. At my advice the following additional precautionary measures were readily adopted by the Collector, whose efforts to keep out plague were unceasing and well-designed, and had been crowned with success for 11 months :—

(A) Six additional observation posts were added, so that every road was watched. (B) Traders and cartmen got "pratique passes," and were medically examined coming and going. (C) Notification of all diseases was made compulsory. (D) Notification of all deaths was made compulsory, and no corpse was allowed to be disposed of without medical inspection or a medical certificate as to the cause of illness and death. (E) All cemeteries and burning-grounds were carefully guarded, and nobody could be disposed of without a permit, and a special burning ground was selected for the disposal of plague corpses. (F) I made a careful daily scrutiny of the death register, and the returns were compared with the average daily death-rate for the past 10 years and for the same periods of the year.

I personally visited every village within 3 miles of Satara, and made a careful house-to-house inspection, but could not detect any cases of plague, or, indeed of much sickness of any kind, during the month of August 1897. Printed plague preventive rules were widely circulated everywhere up to 20,000 in number, both in the districts and cantonments, in English and Marathi. (See Appendix No. 1.)

The first case that really can be looked on as a truly imported case got secretly into the city through the fields by night, and was discovered on the 14th February 1897. This house was unroofed, disinfected by mercury and

vacated, and does not seem to have been the source from which infection subsequently spread. Curiously enough the same locality was freshly infected on the 27th September 1897 by a resident of Satara who went to collect taxes in the Pathan taluka ; and the first indigenous case occurred in his house in the case of his child on the 3rd October, and resulted in her death on the 5th October 1897.

Histories. The locality into which plague had been thus secretly imported was carefully cordoned and medically inspected twice daily, and after 15 days' freedom from plague the cordon was withdrawn.

Removal. Finally it was decided to vacate the infected area, and the healthy were removed to a health camp at Godoli, 2 miles outside the city ; but no further cases of plague developed amongst them.

As a further precautionary measure all the four infected houses were burned to the ground, and compensation costing eleven hundred rupees given to the owners. The houses had been previously disinfected with mercury and the roofs completely removed.

One house, 100 yards (across a deep nullah) from the nearest house in the infected area, then developed four cases of plague on 10th November 1897. This was a house consisting of three small, dark, stuffy, ill-ventilated rooms, inhabited by two families of barbers. The heads of the families were two brothers, who, with their two wives and four children, lived in this house.

Fresh focus of infection. I was engaged in house-to-house visitation when, at about 8 A.M., a report was brought to me that three people were suffering from snake-bite in this barber's house. I at once proceeded thither, and found one boy, aged nine, already dead of plague and two women and another boy suffering from undoubted plague. They had all been attacked suddenly during the night. This house was also burned.

The Gujars in another quarter secretly conveyed fugitive plague patients from Poona ; and 500 yards away from the other infected locality a fresh focus of infection was started, and a charwoman who used to work in this

house was attacked on 19th November 1897. This was discovered later. Dropping cases now continued to occur during November.

Epidemic.

It is to be noted that the disease spread from and around those parts into which it had been first imported, and in a direction from south to north and from west to east.

It is a remarkable fact that there was a latent interval of about five weeks between the first imported case and the first indigenous case ; and the first indigenous case occurred on 3rd October 1897, whereas the epidemic of indigenous cases really began on 4th, 7th, and 10th November 1897. Only imported cases were found *outside* in the interval of about five weeks. In the Great Plague of London in 1665, DeFoe mentions (Bohn's Select Library Edn., pp. 164-165) an interval of about seven weeks, and pertinently asks, " Where lay the seeds of infection all this while ; what was taking place in the interval ? " Even now we do not know sufficient about the extra-somatic habitats (human and animal), forms, life-history, &c., of the plague bacillus to satisfactorily solve this query. That it does exist we do know. How it exists, where it exists—except by analogy we may make a shrewd guess that it is in the dark, ill-ventilated, overcrowded, and perhaps filthy dwellings of the indigent poor where plague chiefly and primarily abounds—we have not proved as yet, as it has not been satisfactorily identified in dust or air, &c., from plague-stricken houses by competent bacteriologists. Hence also arises the futility and unreliability of purely disinfecting measures alone, unaided by radical sanitary reforms and provision of adequate inlets for vivifying sunshine and fresh air—Nature's great reliable disinfectants.

Now, the inhabitants sought safety and wanted to flee the plague-stricken city ; but no one was allowed to go out, except from uninfected districts, and even those had to go into health camps and continue under medical supervision for seven days. Persons from infected districts were thus detained for whole 10 days. Here I would record my humble opinion, founded on bitter experience, that the Government of India are mistaken in advising that there should be no restrictions or detention of people leaving a plague-stricken city at first. No one should be allowed to seek safety in flight, except under appropriate restrictions ; otherwise infection is conveyed thus to fresh suitable

localities, and propagates freely and reaps a rich harvest in havoc-working disease and death. The disease *is* infectious, *under limitations*, else how does it spread from place to place?

A reference to the diagram will show the progress of the epidemic. During the week ending 14th January the climax was reached with 93 cases in that week; and on each day of the 12th and 13th January the maxima of daily attacks were recorded, *viz.*, 19 cases. The Christmas week was a very dark period, and from 23rd till the end of December, inclusive, 116 attacks were registered.

To show the enormous exodus from the city, about 12,000 people left through our observation camps in six weeks, beginning from the end of the first week in October. Some went to the outskirts of the city, where they camped or built huts for themselves, some went to the neighbourhood of small towns, and some to friends elsewhere. None of them, as far as the civil officials could learn, conveyed infection to their new places of residence. No doubt some did secretly connive at the restrictions to prevent escape and crept out, and thus perhaps infected other places.

Rigorous house-to-house visitation was carried out twice daily, in 32 parties, with the aid of volunteers, chiefly men of influence and position--vakils, school teachers, medical men, &c., &c. It is a notable fact that only two out of 24 of the Municipal Commissioners remained all the time devoting themselves with energy and zeal to stem the pestilence!

European officers, civil or military, were in charge of each division, and night raids were made. An officer was specially told off to visit and search all surrounding villages, and warn them against harbouring refugees from Satara—perhaps plague-stricken people.

I have spoken much with natives—hard-headed, logical, cute, farseeing Brahmin vakils and others—as to the causes of the plague in Satara. Some of their views need only be mentioned to be laughed to scorn as futile and inadequate. The more ignorant of course said it was fate (*kismet*); destiny (*nasib*), predestination (*takdir*). Others, more superstitious, put the visitation down to the Governor's visit, and said

it was "due to his unlucky star," for His Excellency happened to visit Satara about the time the first indigenous cases were discovered. None of them could say, as they did in Bombay, that it was due to sewers or bad drainage, for there are no sewers in Satara City. One old lady I tried to induce to allow ventilation holes to be made in her hovel. She stoutly argued that the disease was due to bad air, and she was going to keep all air out at all costs day and night! I told her the doolie would come for her, if not to-day, then to-morrow. She answered, Let it come; "I have only to die once; but I am going to keep the air out!"

On the contrary, I put it down to the devitalising, life-destroying habits of the people. No one who has not mixed with the Deccani people can have any idea of their ingrained hatred of fresh air. They cover their heads with their blankets, shut every door and window, stuff every crevice with rags or paper, and hang curtains around them by night to keep out air. This habit, taken in conjunction with the fact that their houses are generally small, overcrowded, and perhaps dirty, makes it a wonder, not that they get plague, but that they have escaped it so long.

Every day I held Socratic dialogues in the city streets. They used to argue in this manner, to notice only a few of their tactics. "You say it is due to our habits and hatred of fresh air; but we have lived for centuries like this without plague developing." I answer "That is true, and it is not true. It is not true you have not had plague before. Contrariwise, to give only one instance. In 1689 it broke out with great violence in Bijapur. All attacked with it gave up hope! It had been in the Deccan for *several* years (Gavelli Carerri in Churchill's *Voyages*, iv—191), and carried off *whole cityfulls* of people (Churchill, ix—191.) The mortality at Ahmedabad in 1812—1821 is computed at one hundred thousand souls—a number equal to one-half of the population." [Transactions of the Literary Society of Bombay. Report of 1877, Vol. I, pp. 326-327.]

"Again, even if it were a true contention, what does it amount to? You had plenty of gunpowder, but no fire had been brought in contact with it. You had cracker fireworks in store, but no match had been applied to them, and they did not explode—the gunpowder was not apparent. To use another analogy you will all understand, you had your fields ploughed, manured, watered, and a benignant climate; but you had not the suitable seed sown, and no crop was developed. Now

the seeds of this death-dealing disease were brought from China to Bombay, thence to Poona, thence to Karad, and now to Satara, and it is growing luxuriously where it finds the suitable soil (filth in and around your houses, clothing, and persons), favouring climate (dark, ill-ventilated houses where sun and life-giving air cannot enter), and manure ready (overcrowding) for it. The torch has come, meets with the gunpowder, and the explosions are taking place; and the disease is reaping a rich harvest among you, who hate fresh air and cling to habits that favour its precipitation and rapid propagation."

Some people are exempt, in my experience, from plague. The following have struck me forcibly as practically immune:—

(a) Europeans. In Satara we have an average of 45 adult Europeans and 20 European children and 125 European soldiers, and not one of them has been attacked. Twenty Europeans, including one lady nurse, are daily engaged in plague operations, and have been completely immune.

(b) No Eurasians, Native Christians, or missionaries or their families have been attacked, and according to 1881 census there were 527 Native Christians in Satara City.

(c) No Parsis were attacked, and they comprised about 50 souls, and have all remained at their occupations. Some Natives are exempt.

(a) None of the hospital servants have been attacked; they are engaged as ward boys, sweepers, ayahs, corpse-bearers, &c., &c., and numbered some 60—65 individuals from time to time, yet not one has been attacked. Their immunity cannot be put down to their use of reliable (?) disinfectants, for I cannot get them to do so, and I am afraid set them a bad example in this respect, as I have little faith in their efficacy.

(b) None of the jail population has been attacked. The daily average number of prisoners has been---

| | | | |
|--------------|----------------------------------|-----|----|
| In October | 1897 (in prison and under trial) | ... | 60 |
| „ November „ | do. do. | ... | 57 |
| „ December „ | do. do. | ... | 62 |
| „ January | 1898 do. do. | ... | 70 |
| „ February „ | do. do. | ... | 75 |

And this immunity is all the more noticeable when it is borne in mind that the jail harboured a constantly shifting population drawn from all infected parts, whose friends often were dying of the dire disease, which was also raging around the jail.

(c) The dépôt sepoy of the 3rd Bombay Light Infantry and their wives and families have remained free from plague. They are cantoned in the station immediately to the east of the city and under $\frac{3}{4}$ mile distant, and there is constant communication between the two places. On 15th February 1898 in the Native Infantry lines there were, including sick—

| | | | |
|------------------|-----|-----|------------------------|
| In hospital (17) | ... | ... | 81 N-C. Os. and men. |
| " " | ... | ... | 96 Women. |
| " " | ... | ... | 161 Children. |
| " " | ... | ... | 26 Relatives of sepoy. |
| " " | ... | ... | 21 Followers. |

Total ... 385

(d) The inhabitants of the Sudder Bazaar, less than one mile distant from the plague-stricken city, remain exempt. It has an area of 28 acres, 345 houses, and a population of 1,523, mostly Parsis, Musulmans and Mhars; and in camp or cantonment proper 542 persons are exempt. (e) One very interesting epidemiological fact is that the houseless, wandering beggars known as *Byragees* have not furnished a single plague case either in the returns of Satara City or district. Sir James Campbell in the *Bombay Gazette* gives the beggar population of Satara Collectorate in 13 classes as 9,485 in the 1881 census. The number of homeless beggars is not shown separately and is not available; but I meet them in numbers of one to two hundred every Sunday and Thursday, and see the same faces again and again, and on repeated enquiries they deny that any one of them has had plague. For myself I can state I have never seen nor even heard of a case of plague amongst such people. Asked why they are free from this disease they answer, "We will not hang ourselves by living in dark holes of houses."

(e) Incidentally I would remark another class of Europeans and Natives who, from the fresh-air-inhabiting nature of their occupations, are immune—the sailors *on ships*. No doubt one or two sailors have been attacked in Bombay, but they did *not* contract the disease on board their ships. *Apropos* of this, I especially investigated one such case, and discovered that he had been living in a prostitute's house for a week in the native town. She was taken ill with plague and died, and he developed it the next day but recovered. Surgeon-Lieutenant-Colonel F. F. McCartie, I. M. S., Port Health Officer, in his report remarks that plague developed *inside* the 10 days incubation period on a transport

and on a pilgrim ship, respectively, in only two instances. Note that, contrary to what would have happened on land, in neither instance did the disease spread to others on those ships. In Satara City, in spite of disinfecting and burning of five houses, plague became epidemic, so that it cannot be claimed that it was owing to the liberal use of disinfectants on the ships that plague did not spread, and owing to their neglect or faulty application in Satara that it was not strangled at its birth. No, the whole facts show that where there is plenty of fresh air plague will not spread; nature's reliable disinfectors are at work. But where the habits of the people place every obstruction to the entrance of fresh air plague will spread in spite of the vigorous use of the most approved chemical disinfectants.

(f) The inhabitants of the neighbouring village of Godoli, with an area of about half a square mile and a population of 1,002 people in 160 houses, and less than one mile distant, has remained free from plague; also the village of Kamatpura, half a mile distant, population 286 in 51 houses, has remained free from plague.

In the above villages and instances I attempted to fight ahead of the plague by opening up the roofs 4 tiles, or equal to $2\frac{1}{2}$ feet broad from front to rear and making permanent air inlets, as laid down in Appendix No. VI, in every house. To this I attribute their immunity.

(A) In marked contrast to the above facts, Karanga village, in which there has been great opposition (through ignorance of the populace and encouragement of the revenue patel) to all sanitary precautions and preventive plague measures, especially opening up the roofs and making ventilation holes in their walls, plague is now epidemic, and this is the only place now giving indigenous plague attacks in the returns of Satara City. It will thus be seen that the measures adopted have eradicated plague in exactly five months' time. Karanga village has an area of about half a square mile, has 206 houses, and a population of 2,261 principally cultivators, and a dhobie hamlet attached to the village.

(B) Disinfecting coolies, 11 in number, have been attacked; but since I stopped brushing the walls and whitewashing houses none have been attacked.

(C) Police sepoy, 13 in number, on duty in the house-to-house visitation work have been attacked.

(D) Municipal clerks engaged on this work, seven in number, have fallen victims.

(E) Clean Brahmins, who hate fresh air and overcrowd their houses, have furnished a large proportion of plague cases—166 out of a total of 719 attacks indigenous to Satara City up till the end of February 1898.

(F) In my mind there is no doubt but that plague, as seen in Satara, prevailed in the overcrowded dwellings of the poor in the oldest and most thickly populated districts of the city.

The exceptions in the above classes enjoying immunity prove the rule and carry conviction to a certain demonstration that plague is not filth-fever but “a want-of-fresh-air disease.” For instance, the only exception in which one of the hospital servants was attacked is very apposite and convincingly incontrovertible. This hospital servant had been engaged for exactly two months, living in the servants’ quarters in the hospital compound, and constantly in contact with plague patients all that time. His mother died of plague in the city, and the same day he was engaged removing his effects from the plague-stricken house into one of the camps with the object of leaving Satara and having the property under a camp guard. *The very same day*, on completion of this duty, he was attacked on the road on his way from the health camp to the plague hospital, and died that very night of plague !

Again, a doolie bearer’s wife and child were attacked *in the city*, whereas he is still, after six months’ constant contact with plague cases, including his own family members, and for two months since their death, quite exempt ; but he constantly resides at night and by day in the plague hospital camp ! Another ward boy has lost nearly all his relatives, and an ayah in hospital all her friends, except one who recovered from an attack of plague, yet neither of these servants suffered.

There was one exception also *at* but not *in* the jail in the case of a member of the jailor’s family. The jailor’s house is, from a sanitary standpoint, an ideal house—everything a good house should be structurally. It consists of three large rooms and four small rooms, chiefly bath and cook rooms, &c., has double rows of windows, front, rear and sides, clerestory windows above the abutment of the verandah-roofs on the main buildings, and no less than six large doors with fanlights above them. These measures for ensuring abundance of fresh air were grossly and criminally abused, for the jailor is an ignorant, proud, fanatical, old-fashioned, obdurate Brahmin. He with his wife,

mother-in-law, six children, six buffaloes, and three buffalo calves *practically occupied the same bed* in the central room, with every door and window closed and every exit for fresh air blocked. No wonder one of his children developed plague! They have since gone into re-occupation when the house had been two months vacated, disinfected, &c., and no cases have developed. The man has learnt to love instead of hating fresh air, and the buffaloes and their calves have been banished elsewhere.

Five dead rats were found in the jail in a room next the cook-house. I examined these rats and grew pest bacilli on agar-agar from each of them, and afterwards destroyed the rats by fire. The room in which they were found was unroofed completely; it had never been occupied lately, yet no plague ever appeared *inside* the jail. What plague precautions were used, and to what can one attribute the immunity enjoyed by the prisoners?

The rules circulated by the Inspector-General of Prisons, formulated by our Surgeon-General when he was Principal Medical Officer at Karachi, were carefully followed in every detail. Each prisoner dropped his clothing at the door, had a phenyle bath all over, including the hair of the head, and his clothing was boiled for a quarter of an hour in phenyle 1 in 100 and hot water and put in the hot sun for six hours every day, and he was kept quite apart for at least 12 days after incarceration. Ventilation of cells, and ample cubic space was insisted upon. Every door and window was kept open by day and every window by night, and surprise visits were paid by night to see that this valuable rule was rigorously enforced. Nature's reliable disinfectors had full play; hence, I contend, no outbreak of plague.

No doubt plague has and will occasionally attack persons living in ideal sanitary surroundings and obeying every sanitary law; but those are exceptional instances only, and must not lead one to form hasty and unwarranted conclusions regarding the etiology of the disease. Hence arose the grain theory, the cold-air theory of the natives (why on this theory it ought to prevail only in cold countries—England for choice), the lead-drain theory, &c.; but “those partial views of human kind are surely *not* the best.” On a general view sounder opinions will replace false dogmatism.

Most of those exceptional instances can on investigation be traced to overcrowding, as I have seen in one good house in Satara City, or to

direct inoculation, as in the case of the nurse into whose eye a plague patient spat and in whose case local re-action followed and fatal plague developed, or in the case of Dr. Sticker, who cut his thumb in making a *postmortem* examination and developed plague. Just as we know in the case of the cousin-german disease typhus that it occasionally attacks medical men visiting the typhus patient, yet it is absurd to think that any intelligent, educated physician lives under suitable insanitary conditions which engender an attack of typhus fever.

Those attacks of Europeans in Bombay, Poona, and elsewhere I ventured to explain by analogy thus—increased virulence of the microbe under favouring environment. A tiger cub when but a few days old is not dangerous—a child might play with it ; when it is three months old a grown man may fondle it ; but when it is a year or two old it will attempt to kill, and perhaps sometimes succeed in certainly injuring, if not slaying, even an elephant.

Plague, I most emphatically state, is not a dirt disease. I can point to clean Brahmins being attacked and to filthy Byragees remaining exempt ; to your halalkhores in Bombay enjoying immunity, and to exceptional attacks in the case of people who abuse the existing means of ventilation in their habitations, or through ignorance fail to provide for ventilation.

Prisoners in jail would be filthy if they could, but are exempt although their relatives die in the town. (I have often told the Satara people that the best thing that could happen to them would be to get imprisoned, for then they would not die of plague.) If you point to Umarkhadi Jail as an infected jail, I answer there must be something wrong there—overcrowding, unsuitable locality or what not, and point you to the conspicuous examples of Yerrowda and Satara jails, where plague has never been, although raging all around them. If you still think plague is a filth disease, how will you explain the immunity of Wai, the most insanitary town in the presidency, where “the Municipality assemble in force to vote against every sanitary reform” in the words of the Sanitary Commissioner ? My predecessor’s report—Dr. Davidson, Civil Surgeon of Satara, in March 1897, when plague was not within, one might say, tangible distance of Wai—is most appalling, although painted in non-exaggerated language.

“The camp had a severe test, for within 30 yards of my house a lady permitted her tailor to come into one of her outhouses (in spite of printed exhortations to the contrary) on 19th December. That house

was burned, and the other servants living under the roof segregated. Yet no other cases occurred in cantonment limits. The tailor said he had toothache. I found a bubo the size of an orange in his right groin, and removed him the next morning."

Amongst other posers of questions put to me by the Satara people was the necessity for Government measures in the direction of segregation in plague, whereas no such measures were enforced against cholera. They very logically pointed out that cholera comes every year and kills off thousands of people, whereas plague comes only once in a century perhaps, hence why this difference leading to trouble to the people. I endeavoured to answer this question in the following manner, and hope it meets with the approval of the members of this Society—my compeers and superiors.

I pointed to the house as the poisonous place, that it was a want-of-fresh-air disease (as proved by those amongst whom it was epidemic and those exempt), and that removal of the sick into fresh air afforded the only chance of recovery, and gave every prospect of exemption for his relatives and other occupants of the plague-infected house.

The opposite plan had been tried in the Great Plague in London in 1665, when we were ignorant of its nature, and that "3,000 people died in a single night, and all within the space of two hours (*De Foe opcit*, pp. 138—139); that about 50,000 died within two months (*opcit*, p. 71); that many houses were left desolate, all the people being carried away dead (*opcit*, p. 139) several houses together which had not one person left alive in them" (*idem*). I pointed them to the Nizam's territory, where there was as yet no segregation, rather the opposite, as in London, the people being opposed to segregation, and that there, as in London, whole villages were left desolate, whole households died, leaving no heir. Which arrangement was most deserving of praise—segregation of the healthy contacts and removal of the sick to open hospitals, or shutting them up in their houses, so that they all died? In the one case some recovered amongst the sick, for it is a very fatal disease, but most of the friends survived, and in the other case none of the sick recovered, and all the friends of the patient first attacked sickened and died. In the one case, no doubt, there was some temporary inconvenience (they called it oppression, *zoolum*), but people survived and the object of Government was attained—the salvation of the people from this voracious tiger; in the other case there was no arrangement, no inconvenience, plenty of property, ornaments, &c.—but NO HEIR.

In the instance of cholera it was altogether different. Cholera was chiefly a bad-water disease, did not wipe out whole families—run through the family as the poor Irish say. Cholera is a common tiger; this plague is a man-eating tiger, and, left to itself, devours whole cities (*vide ante*); and if Government did not undertake rescue measures, not on the grounds of conserving our international commercial relations merely, but on the advice of sanitary scientists and experienced medical men, Government would be neglecting its sacred trust and its primary duty towards its ignorant subjects.

As late as 1877—1879 in the Volga district, one of the recently arrived members of the Russian Scientific Commission tells me about one-fifth of the population of the Volga district died of plague, and 90 per cent. of those attacked died, even under partial segregation. In regard to segregation, I should like to mention a practical point that goes a long way to soften its inseparable hardships, that is, that the friends of the plague patients should be segregated near the plague hospital. One friend at least should be allowed to attend on the patient, and the others, after disinfection and bathing, allowed to come near to make enquiries, arrange for disposal of the body in case of death, &c., &c. It does seem a needless cruelty to put the friends three miles or so apart, as has been done elsewhere. In Parel last year the friends were segregated near the patients, and, as is well known, no examples of plague arising from such contiguity occurred. I still adhere to my previously expressed conviction, which nine months further experience has not modified, that the wards of a sanitary plague hospital is one of the safest places during a plague epidemic. (Parel Hospital, Gatacre's Report, Bombay Plague, 1897.)

As elsewhere, all plague houses are disinfected with mercury perchloride solution, marked with a circle containing the number of the plague case in the Municipality register, and "P" underneath the circle. The city is in process of being disinfected, and as each house is disinfected, the letters "G. D." (general disinfection,) and the date are painted on it. An important item of detail is that every coolie is carefully searched by the police going on and coming off duty, and the house owner or his representative signs a receipt that nothing has been damaged or stolen. The coolies live in a separate shed near the Municipality head-quarters office, and are under police guard by night, and must answer to roll call morning and evening before the guards and sentries are posted over them.

A yellow label is affixed to each non-plague house (Appendix No. II.) A red label is affixed to each plague house. (Appendix No. III.) houses un-occupied are locked and sealed. When they are to be disinfected, 72 hours' notice is sent to the previous occupant, and a similar notice is pasted on the door giving the proposed date of disinfection. The locks of sealed houses are opened in the presence of the Sub-divisional Officer and a police sepoy, who takes an inventory of their contents.

Instances of plague in disinfected houses have come to my notice in two cases six days after disinfection, so that this is within the incubation period. In one case a house was disinfected by Mr. Brady, who is held up as the reliable disinfector of Karad, and Karad has been instanced as an example of the success of good disinfecting, yet 20 days afterwards the first plague case developed in this house. I wont go the length of proclaiming that disinfection is useless, but merely state that it is not everything in removing plague epidemics, and is not reliable. I have elsewhere helped Hankin to prove that acidulated perchloride of mercury is "distinctly good" in results but not absolutely effective. My opinion, practically and from laboratory experiments, is that chemical disfectants only scotch but do not kill the pest microbe. *N. B.*—Cases have lately become indigenous, not merely been imported into Karad.

As regards virulence of plague during an epidemic, it is generally stated that mild cases are seen at the beginning and at the end and most virulent cases in the middle period of an epidemic. I am in accord with this; but at the same time I have seen cases at the end and in the beginning quite as virulent as I have ever met with anywhere and this corresponds with my experience at Parel, March to July 1897.

Amongst a crafty, bigoted, untruthful people who conceal cases, it is not fair to judge the results of any method of treatment which, applied early and with appreciation of its usefulness and intention rather than with dilatory consent or sullen jealousy and mistrust, would likely give more favourable results. The attempt to extract the day of disease, even by assertions that such information made a great difference in the medicines necessary, proved utterly unreliable. Besides, many patients at first refused treatment, and afterwards, seeing recoveries and induced by their friends' entreaties, agreed to take hospital treatment; and such are included amongst hospital cases.

Again, others followed my advice and kept strictly lying down, *the*, in my opinion, most important single conservative plague treatment, and recovered, although they refused every drop of hospital medicine.

There is however a marked contrast in the two classes—(a) under hospital treatment, and (b) refused medicine—for 22 per cent. of the former recovered, whereas only 11 per cent. of the latter recovered.

At first they said I poisoned them and cut out their livers to send to the Queen-Empress. I took steps to disabuse their minds by asking all the available Editors of the native papers to visit the hospital with me, and every patient had his free choice of taking or refusing hospital medicine, or could call in his own native practitioners. Soon their fears disappeared. All the native practitioners died of plague, except those that I succeeded in converting to my views, and nearly all their friends and patients also succumbed.

I told them they must be got out of their death-traps, and removed either by their own arrangements or in the municipal ambulance to the plague hospital; but they are not required to take hospital treatment, food or water even, that is provided there for them.

By those means their fears disappeared, and they recognized the value of early treatment. There are fewer concealed cases and more recoveries consequently than at first, and they are willing to allow the crowbar brigade to work at making holes for permanent ventilation in the walls of their houses. This in my opinion is the most important preventive sanitary measure for preventing so-called recrudescences of plague. It is a measure that would have met with violent opposition, and perhaps open resistance, at first, as the people are obdurate and proud; but they were taken very gradually, and the objects of our measures thoroughly explained to them beforehand with great tact and discretion.

As regards the incubation period of plague, I would fix it as certainly within 12 days. As a matter of fact I have only met with three cases on the tenth day after segregation, and none at a later period. Some stayed much longer in our camps than ten days, yet never developed plague. Many refused to leave when granted permission to do so, as their fears had altogether disappeared. Not only so, but their habits were changed, and

Incubation period.

they no longer dreaded fresh air, and although we had 800 to 1,000 people daily present in camps as a rule, they had no plague (certainly never after ten days of segregation), no cholera, no coughs nor colds, no bronchitis, no rheumatism, no itch, no ringworm, no skin diseases, no worms (and those are the permanent plagues of such peoples' lives), and they slept better, were stronger, had better appetites, and felt better than they had ever done. They wondered that they had not died of too much air—of cold air—till I explained to them it was their want of being accustomed to it that made them suffer subjectively and feel cold previously. Just as a man who is accustomed to bathe in cold water daily can do so all the year round, at home or abroad, winter or summer, without injury, so one gets used to cold fresh air. But if one is accustomed to a hot or lukewarm bath daily, an immediate resort to a cold bath would perhaps be dangerous, so one must gradually accustom oneself to love what one used to hate—to look on one's former supposed enemy as one's best friend.

The complications seen in Satara have been in the main the same as chronicled in the Parel Hospital report ; but
Complications. the following are worth reiterating or noting :—

One case began with aphasia, and lasted thus till death.

One case began with dementia and serous apoplexy, but ultimately recovered. One patient, out of hospital, committed suicide by jumping into a well when he recognized that he had plague.

There were five undoubted cases complicated with syphilis, and one died.

At Parel, out of 304 acute plague cases I never saw a case with carbuncle, whereas four such so-called carbuncular cases were seen at Satara. Of these two died and two recovered.

In one of the cases a necrosed patch of skin and subcutaneous tissue appeared on the left side of the neck just below the left ear ; another case had a similar patch 2 in. long by 1 in. broad on the tip of the left shoulder, the left axillary gland being enlarged and inflamed ; another case had two black blister-like patches on the right chest, and right axillary gland inflamed ; and the fourth case developed a huge slough—coal black in centre, ashy-grey at margins, and skin surrounding red and granular-looking on outside left thigh

One patient had a huge bubo on the left side of the cheek in front of the ear, which opened into the oral cavity by numerous (200 or upwards) minute openings, and many similar pin-hole openings on to the cheek, without suppurating.

Two lepers developed plague, of whom one died and one recovered. Both had loss of fingers and toes and the leontine facies of anæsthetic leprosy; and the father of one had leprosy; the other had no friends alive.

One very interesting case developed acute small-pox and plague, and the diagnosis was confirmed by bacteriological cultures and microscopic examination. This case died.

As a clinical fact I place on record the curious observation that many patients with suppurating buboes have no rise of temperature, but only heating, suppurating pain in their abscesses. Perhaps this may be accounted for by the well-known phenomena that convalescent plague patients' temperatures are often sub-normal, and that the force of suppuration is only sufficient to bring this sub-normal temperature up to the standard of health.

Primary plague pneumonia furnished 10 cases, all fatal. This corresponds to Parel experience.

Without buboes are returned as 168 in No. 2 Hospital with 120 deaths and 48 recoveries, and in the hospital under my charge as 57 with 39 deaths and 18 recoveries; but in the latter hospital every doubtful case was kept under observation until the presence of plague was certainly declared.

Convulsions, 18 to 20 per minute, were seen in two cases not undergoing strychnine treatment. They were confined to the upper extremities. Children frequently died, struck down suddenly and convulsed without developing buboes, and this confirms Parel experience.

There were five pregnant females admitted. All aborted, and all died. They were all over three months pregnant, and in most cases the foetus had black bullæ on the skin all over body, and all the foetuses died or were born dead.

Three nursing mothers suffering from plague suckled three children, one such only 15 days old, yet none of the latter contracted the disease.

Three children were plague patients, and were nursed at their mothers' breasts, and the mothers never contracted the disease.

The sequelæ were the same as at Parel, except that boils were not so frequently in evidence.

No cases who had been inoculated by Haffkine's preventive were met with; and very few, if any, of the people at Satara have been inoculated. All efforts to persuade them to resort to Haffkinism have, for various reasons, hitherto failed.

Two monkeys died suddenly in the city, and by *post-mortem* examination and bacteriological culture they were proved to have died from plague. Numerous plague rats were also found and similarly investigated; and the paucity of rats anywhere in the city is remarkable, and has been commented on by the inhabitants. I look upon the finding of dead rats as the precursor of a plague outbreak, and their discovery affords a warning to vacate the premises and adopt precautionary, preventive, and sanitary measures.

The friends of a patient applied 18 leeches to her bubo from time to time, and I refused to allow those leeches to be given back to the leech woman. They were examined on agar-agar, and cultures of pest bacilli found from their blood, and they all died. The fact that leeches applied to plague buboes can convey the disease to other people has been proved in the present plague epidemic in Jullunder district, and reported on by my friend Surgeon-Captain C. H. James, I. M. S., Deputy Sanitary Commissioner, Punjab.

Post-mortem on one case that was seen at 12 noon and temperature then normal, and no signs or symptoms of plague, enabled foul play by poisoning to be excluded, and proved beyond a shadow of doubt that the man died before 5 P.M. the same day of plague, the *post-mortem* appearances being numerous and characteristic. An enlarged gland was found deep in the lower axilla, not tangible by palpation.

A diagram shows the deaths out of hospital. Several conclusions may be drawn from a number of deaths out of hospital, and one or all may be justified. One is that a good deal of concealment is going on proportionate to the number of such deaths. Another indicates great virulence of the disease, as is evidenced by the sudden death before 5 P.M. of a patient who was quite well at noon of the same day. Most of the deaths out of hospital occurred at night. No dead bodies were found on the roads or in the fields, or neglected by friends when any such existed.

In addition to what I have already placed on record in the Parel report, I think the following worthy of remark in
 Diagnosis. diagnosing plague :—

(i) That the patient invariably has an aversion to being considered ill, and yet looks ill. That this is not entirely due to fears of segregation, &c., is proved by an extract from an old book printed in 1818 regarding the Malta plague, of which Russel wrote and Faulkner records that “the initiatory symptoms, besides the foregoing, were pain in the back opposite to the kidneys, drunken appearance of the countenance, inability to stand upright, and *aversion to being thought ill*” (Johnson on *Tropical Climates*, p. 334, footnote, 2nd Ed., London 1818). At this time and in Malta it is hardly likely that fears of segregation caused the patient to deny illness.

(ii) Hesitating speech is a most constant and valuable diagnostic sign.

(iii) Staggering gait

Under this head I would warn every medical man in charge of camps or hospitals never to discharge a patient or suspect without making him undergo what I call the “walking test.” If he can walk and turn round without a drunken reel in his gait, ten chances to one he is not suffering from plague.

(iv) In addition to injected eyes, &c., of course the best test is the discovery of the characteristic bacillus in the blood, *in fatal cases only* or in a little matter extracted from the bubo and grown on agar or examined in covered glass preparations with suitable staining and fixing.

Let me warn medical men not to rashly conclude that any suspect is not a plague case because his temperature is normal and he has no bubo. Even with six months' experience of plague I nearly made this fatal error, and was willing to allow a suspect to go in the morning on the above grounds, &c., but fortunately in the evening the patient developed fever and a bubo and real plague. To the same end (Johnson's *Tropical Climates*, *op. cit.*, p. 339) Russel wrote : “*Buboes*.—The presence of these is diagnostic of true plague, and removes all doubt as to its nature; but fatal has been the error of rashly, *from their absence*, pronouncing a distemper not to be the plague, which in the sequel has desolated regions, and which early precautions might probably have prevented from spreading.”

An impression remains with me that, as a rule, when the eyes (or eye) are injected, it will usually be the eye on the same side as the bubo that is so altered, or that shows the change in the most marked degree.

(I) The most important point, I still hold, is do not let the patient sit up, for any purpose whatsoever, until the temperature shall have been normal for at least four days.

Treatment. Fatal in numerous instances in Satara has been the result of a breach of the primary rule in my plague administration in hospitals.

(II) As for drugs, perchloride of mercury in large doses, which I introduced in March 1897 at Parel, has proved itself worthy of further trial, and given early and combined with strychnine (the next sheet anchor of treatment) and stimulants, and frequent feeding and good nursing, gives good results without subsequent salivation.

(III) For sleeplessness opium in some form with bromides is good.

(IV) Hyoscine up to $\frac{1}{4}$ grain I rely on for wild delirium. It controls the delirium, but most such patients die on any and every treatment.

(V) Iron, quinine, massage, and nux vomica are useful for the anæmia of convalescence.

(VI) The bubo, I still think, should be treated with emollient *sedatives*, and not irritated, poulticed, or blistered, &c. There prevails in Bombay a great outcry amongst the ignorant that poulticing and fomenting the bubo disperses the disease through the system generally.

(VII) Digitalis being a cumulative poison, causing sudden collapses if the patient sits up under its use in any disease, and thus acting like plague toxins through the central nervous system, is not to be given, in my opinion, to plague patients. In most cases the heart musculature (exclusive of febrile changes perhaps) is quite sound in plague *post-mortems*.

(VIII) Phenacetin, antipyrin, and antifebrin, for the same reasons, are dangerous.

The only reliable disinfectants are (1) fire and superheated steam ; (2) strong sunlight ; (3) free ventilation. Clothing if good is boiled for quarter of an hour in 1 per cent. solution phenyle with $\frac{1}{4}$ lb. soap and

2 drachms kerosine oil. The latter is an antipodean tip, and whitens linen and cotton clothes and cuts the dirt off all garments, and is much used in New Zealand and Australian households. I recommended the Collector to procure a Washington Lyons' steam disinfecter, but he considers the cost prohibitive.

Every one in Satara must have a residential pass stamped by the Municipality, filled in in serial numbers by the Divisional Plague Officer, and signed by him. (Appendix No. IV, coloured yellow.) Visitors are allowed into the city for the day on a brown pass which they receive and give up at the police posts. Those passes are daily checked. The object of such passes will be seen on referring to Appendix No. V.

The population of Satara City on 1st March 1898 was 3,438 persons, living in 891 houses, exclusive of jail, hospital, and police line residents. The unoccupied houses are all locked and sealed. The city is in process of house-to-house disinfection, and no plague house has up till now been allowed to be re-occupied. Before re-occupation all such houses will be *again* disinfected with acidulated perchloride solution.

When the population, exclusive of watchmen and those in good, well ventilated houses, shall reach our camp accommodation limits, it is proposed to cordon the city at night during the coming moonlight, and permit no one to sleep inside their houses or be in the city between 9 P.M. and 6 A.M. for 15 days. By this we hope to precipitate the decline of plague. If all residents remain free, this plan need not be put into execution ; but all houses and all residents and clothing and effects having been disinfected outside, the city remaining absolutely free from plague, they may begin to be re-admitted at the end of a month.

Dropping cases continuing to occur the plan should hasten their disappearance. Then exchange the present camp inhabitants after disinfection, bathing, &c., with the city residents, allowing free access to medically inspected visitors by day, and the curfew tolled at 9 P.M. will warn every one without a residential pass to clear out and proceed to the health camps. The city will be patrolled by mounted police it is proposed, and everyone caught and challenged for their residential pass, and those without one removed under escort.

Officers on plague duty will visit the different posts, ten in number, and go round the cordon at intervals, and others will patrol the city to see that everything is in order, no robberies, &c., being committed.

As the houses are re-occupied, it is intended to see to their further ventilation. Most of them have already had openings made as part of the routine of disinfection. (Appendix No. VI.) In addition a Board to carry out the following measures is, in my opinion, urgently required, not only in Bombay, but also in Satara and everywhere :—

1. A Ventilation Act.
2. A Public Nuisance Act.
3. A Building Act.

The Sanitary Board should consist of—

1. The Chief Magistrate (or his local representative in villages).
2. The Executive Engineer or his representative locally.
3. The Civil Surgeon or his representative locally.

The same Board, as occupation of houses is going on, should revise submitted lists of houses that, in the opinion of the different Plague Divisional Officers, are unfit for human habitation, and decide as to their demolition if the Plague Divisional Officer's opinion is confirmed.

By the appearance of plague in a community hitherto blind to the benefits of hygiene, the new science of sanitation has received a new impetus, and sanitary reforms for the permanent well-being of the people scourged by preventible diseases like plague, cholera, ringworm, itch, skin diseases, worms, &c., will be readily acquiesced in and heartily espoused. Good shall result and spring from an apparent catastrophe and present evil.

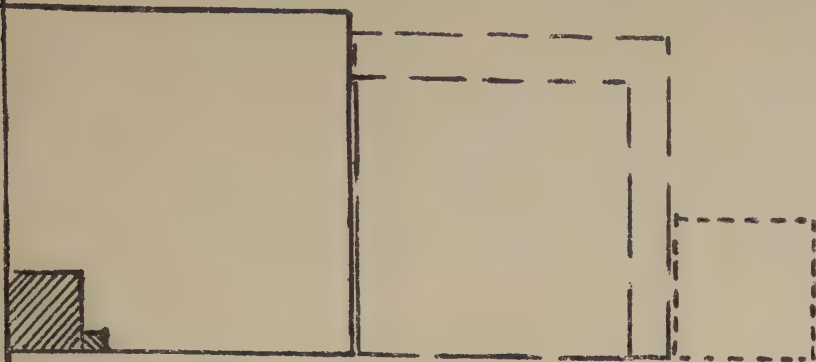
APPENDIX No. I.

SUGGESTIONS AS TO WHAT THE VILLAGE RESIDENTS SHOULD DO TO PREVENT THE OCCURRENCE OF PLAGUE.

1. Keep the clothing clean by washing it at least once weekly.
2. Keep the person clean by bathing the whole body daily.
3. Keep the house and surroundings clean.

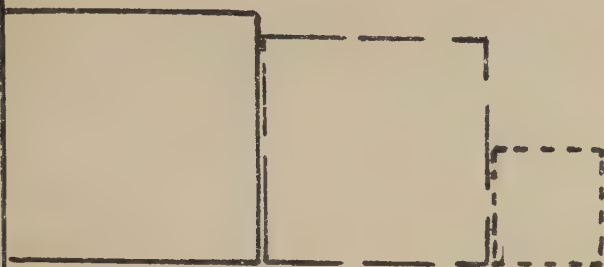
SATARA CITY PLAGUE,

JANUARY 1897.-FEBRUARY 1898.



IMPORTED. 35. SUSPECTED. 2. DIED. 605. { IN HOPITAL 459 } RECOVERED. 111.
INDIGENOUS. 684. { OUT OF " 146 } & 3 REM. 9

Nº1. RANCHATRI PLAGUE HOSPITAL.



ADMITTED. 390. DIED. 308. RECOVERED. 82.

Nº2, BUDWAR PLAGUE HOSPITAL.



ADMITTED. 170. DIED. 133. RECOVERED. 37.

SEPTEMBER 1897.



IMPORTED. 4. DIED. 1. RECOVERED. 1.
FROM
KARAD. 2.
WAI TALUKA. 1.
PATAU TALUKA. 1.

OCTOBER 1897.



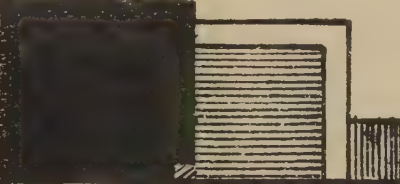
IMPORTED. 9. DIED. 7. RECOVERED. 4.
INDIGENOUS. 1.
FROM
PADLI SATARA ROAD. 3.
WADHA. TALUKA. 1.
POONA. 1.
AUNDH. 1.
KARAD. 3.

NOVEMBER 1897.



IMPORTED. 4. DIED. 26. RECOVERED. 7.
INDIGENOUS. 34.
FROM
POONA. 1.
TASGAON. 1.
KOOSHI. 1.
SHOLAPORE. 1.

DECEMBER 1897.



IMPORTED. 1. DIED. { IN HOSPITAL. 118. } 163.
INDIGENOUS. 198. { OUT OF " 49 }
RECOVERED. 14.
FROM
SHOLAPORE. 1.

JANUARY 1897.

ARRIL 1897.



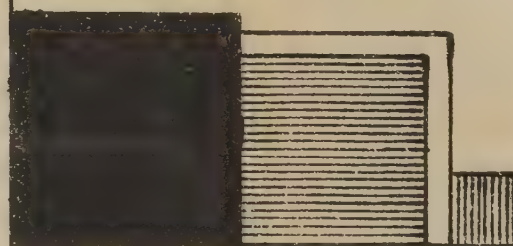
IMPORTED. 3. DIED. 3.
FROM
BOMBAY. 3.



IMPORTED. 1. SUSPECTED. 1. DIED. 1.
RECOVERED. 1.
FROM
POONA. 1.

MAY & JUNE - NIL

JANUARY 1898.



INDIGENOUS. 352. DIED. { IN HOSPITAL. 217. } 295.
RECOVERED. 35. { OUT OF " 78 }

FEBRUARY 1897.

JULY 1897.

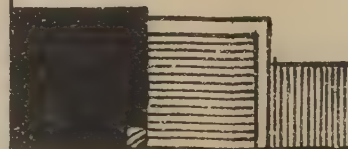


IMPORTED. 3. DIED. 3.
FROM
POONA. 3.



IMPORTED. 2. DIED. 2.
FROM
KARAD. 2.

FEBRUARY 1898.



IMPORTED. 2. DIED. { IN HOSPITAL. 76. } 99.
INDIGENOUS. 99. { OUT OF " 23 }
RECOVERED 37.
FROM
SHOLAPORE. 2.

MARCH 1898.

AUGUST 1897



IMPORTED. 2. SUSPECTED. 1. DIED. 2.
FROM
POONA. 2.



IMPORTED. 4. DIED. 3.
FROM
KARAD. 3.
IGATPURI. 1.

4. If dead rats are found vacate the house *at once*, and report the fact at once to the patel or kulkarni or any other officer. The dead rats must be burnt by placing them on straw. They should not be handled or touched in any way. They should be caught with tongs placed on straw, some kerosine oil should be put on, and burnt.

5. Do not permit strangers to live in your house. There is risk of getting plague from them.

6. Air must be allowed to enter the house freely day and night. Many persons should not overcrowd in one part of the house. All clothing and bedding should be spread in the sun for six hours daily at least.

C. B. WINCHESTER, Collector.

SATARA, 2nd August, 1897.

APPENDIX No. II.

CERTIFICATE REGARDING THE HOUSE BEING WASHED.

| | | |
|-----------|------|--------------|
| House No. | Peth | Satara City. |
|-----------|------|--------------|

This house has been thoroughly washed. The person who lives in the house for protecting the house only, and who has obtained a pass to that effect from the Divisional Officer, is only allowed to sleep in the house; the rest are strictly prohibited from going and sleeping in the house without the permission of the Divisional Officer. Date month 1898.

Divisional Officer and Plague Authority.

APPENDIX No. III.

| | | |
|-----------|------|--------------|
| House No. | Peth | Satara City. |
|-----------|------|--------------|

This house has been thoroughly washed. No one should occupy the house without the permission of the Divisional Officer. Date month 1898.

Divisional Officer and Plague Authority.

APPENDIX No. IV.

PASS FOR LIVING IN HOUSE
NIGHT AND DAY (ACCORD-
ING TO 6TH RULE.)

No.

Peth.

Name.

Occupation.

Date month 1898.

Divisional Officer.

PASS FOR LIVING IN HOUSE
NIGHT AND DAY (ACCORD-
ING TO 6TH RULE).

No.

Peth.

Name.

Occupation.

Date month 1898.

Divisional Officer.

APPENDIX No. V.

RULES REGARDING PERSONS ENTERING AND
LEAVING SATARA.

1. No one shall be allowed to enter or to leave Satara before 6 A. M. or after 8 P. M.

2. In future general passes will be issued, as hitherto, by the Chief Plague Authority to persons wishing to leave Satara for one day on condition that the persons asking for them live in the Budhawar Camp.

3. No person who does not live and sleep in the Budhawar Camp will be allowed to leave Satara on a general pass.

4. No one will be allowed to leave Satara permanently unless he has spent 10 days in the Wadha Camp.

5. Persons living in the Godoli Camp will be allowed to visit Satara during the daytime, provided that they show to the police at the post near the Godoli village a certificate signed either by the medical officer in charge of that camp or by the resident karkun at that camp.

6. No one will be allowed to reside and to sleep in the town unless he is provided with a "permit to reside," which will be given to him at the discretion of the Divisional Officer.

7. No person will be allowed to enter the town of Satara without an "entrance pass."

8. Such entrance passes will be given at the different nakas to persons wishing to enter the town and promising to leave on that same day.

9. A person leaving the town who has entered with an entrance pass shall give up that pass at the naka by which he leaves.

10. The nakedars shall every morning, before 10 A. M., send to the Municipal Office all the entrance passes collected by them on the previous day from persons leaving the town, together with a letter stating the number of passes issued by them during that day. (If the number issued during the day does not agree with the number collected during the day, the Municipal and other Plague Authorities will understand that people are trying to live in the town without permission.)

11. If a person leaving the town presents an "entrance pass" dated previous to the day of his departure, the nakedar shall detain him and send him to the Wadha Camp, which he shall not be allowed to leave until he has spent 10 days there. (*Vide* Rule 4.)

12. Any person found at any time in the town without a "permit to reside" or an "entrance pass" issued to him on the day on which he is so found or a "camp pass" shall be at once sent in charge of the police to the Godoli Camp, and compelled to stay there until the officer in charge considers that he can safely be released.

13. The "pratique passes" hitherto issued are henceforth abolished. All persons wishing to enter Satara and remain there for more than one day shall be sent by the nakedar to a camp (see Rule 14), where they will be medically examined. If found free from all symptoms and suspicion of plague, they will be allowed to

enter the town ; but they shall be bound to spend the night at the Godoli Camp. After sleeping there for 10 consecutive days, they may be allowed to go to their houses in the city, provided the Divisional Officer consents.

14. The camps referred to in Rule 13 shall be—

- (1) for persons coming along the Mahableshwar and Wai roads and other roads from the north—the Budhawar Camp ;
- (2) for persons coming from the direction of the railway station—the Wadha Camp ;
- (3) for persons coming along the Mahuli, Rahimatpur and Karad roads, and through the tunnel—the Godoli Camp.

Such persons shall be sent to the camps in batches in charge of the police at 8 A. M. and 4 P. M., unless they come in very frequently, when the police must make their own arrangements.

15. The Chief Plague Authority and the Divisional Officers shall have power to waive Rule 3 at their discretion by the issue of a special order.

16. The following persons shall be exempt from the operation of Rules 2, 3, 4, 6, 7, 8, 9, 12, and 13 :—

1. Europeans.
2. Government and Municipal servants.
3. Plague Authorities on duty in the city and suburban Municipalities of Satara.
4. Vakils on professional business.

Nos. 2, 3, and 4 shall be given permanent passes by the Chief Plague Authority or Municipal Secretary. They shall be bound to produce these passes when called on to do so by the nakedars or other officers on plague duty, unless they are wearing a Government uniform.

C. G. DODGSON,
Collector and District Magistrate.

SATARA, 19th February 1898.

No. D—2 OF 1898.

Camp KARAD, 28th February 1898.

Forwarded for information to Dr. Thomson, Divisional Officer, Satara.

C. G. DODGSON,
Collector of Satara.

APPENDIX No. VI.

NOTICE.

RULES REGARDING THE WASHING OF HOUSES.

1. All persons in the house which is to be washed should be taken out, and all the moveable property being taken out should be kept in the sun in the presence of an adult person under the police guard.

2. Principally the floors of the house must be washed with the prepared solution, and if there be not sufficient light or air in any one of the rooms of the house, holes measuring 10 inches in length and 6 inches in breadth should be made in the walls of the room. The Inspector in charge of the house-washing work should at first shut the doors of the room, and if there be not sufficient light in the room so as to recognize the features of another person, necessary holes admitting sufficient sunlight should be made. These holes should not be more than four in a room. If it be possible these holes should be made at least at the height of 6 feet from the ground, and they should be of such dimension that a person's (thief's) head could not be passed through them.

3. Furniture in the house should not be washed, but it should be kept only in the sun. Corn or food should not be thrown on the ground, and the property should not be damaged in any way. Useless rags, after being carefully selected by Mr. Brady's or any other superior officer's order, or in the presence of the European officer, should be burnt.

4. All residents are strictly prohibited from giving bribes to house-washing persons. Bribe-givers as well as bribe-takers will be prosecuted under the existing law of Criminal Procedure Code, and besides all expenses on account of washing houses, taking furniture out of a house, and making holes in the house for light and air are conducted by Government.

5. The public are hereby informed that they should at once give information to the Collector or to Mr. Kharkar if the house-washing persons ask for bribes, or if they infringe the abovementioned rules they will be at once prosecuted. By this notice officers in charge of house-washing work are informed that if they break the rules cited above, or if they show carelessness in complying with these rules, or if they damage the property, they will be at once turned out from their work and punished.

6. There is very little chance of plague breaking out in the parts of the house in which there is free ventilation of air. But the house in which there is not sufficient light or free ventilation of air, there the disease is likely to occur (particularly amongst the women and children). We therefore tell the people earnestly for their own good that they should make windows for admitting sunlight and air into the houses in which there are not sufficient windows or doors for admitting sunlight and air.

GEORGE THOMSON,
Civil Surgeon.

Dated 19th January 1898.

NOTICE TO THE PUBLIC.

The public are informed that it is settled that the whole city of Satara should be washed to check the progress of plague which has broken out in the Satara City. First the houses in the southern part of Mangalwar Peth and in the Ramachagota are to be washed. The people should go and inquire in the Satara Municipal Office when their houses are to be washed, and they should arrange to be present on the day on which the houses will be washed.

M. R. JOSHI,
Secretary.

B. M. KHARKAR,
Chief Plague Authority and Chairman.

DR. (MRS.) SLATER asked what became of the mass of the people who were turned out of the city.

BRIGADE-SURGEON-LIEUT.-COL. CLARKSON said that from the sanitary point of view the great object was the prevention of the disease. And in this connection the following points were of some importance :— (1) The length of time that was found to elapse between the actual importation of the organism into a place and the sudden epidemic outburst which followed later. The interval appeared to average from a month to a month and-a-half when the germ was introduced by man; but when imported by rats the period seemed to be much shorter, *e.g.*, in Thana last year (*vide* Surgeon-Major Anderson's report). (2) A second matter that required more accurate definition was the period of incubation of the disease. Surgeon-Captain Thomson had men-

tioned an instance of ten days. It was very difficult to fix a limit to the period, since infection was often indirect and might occur from infected clothing, &c., some time after contact with the original source of contagion—the plague patient. Another matter of interest would be to determine the age-period most liable to attack. Infants under one year were not often seized, and even under 20 years it was not very common. From 20 to 40 years of age appeared to embrace the majority of the cases. Males and females, as far as he knew, were equally liable to the disease.

Dr. S. NARIMAN spoke as follows :—

MR. CHAIRMAN, LADIES AND GENTLEMAN,—My experience about plague is very limited, and I only wish to allude to a few points which impressed me most in my daily duties both in Poona and Bombay.

2. Proportionately a very large number of plague cases is found in rooms directly under a sloping roof, either tiled or thatched, such as afford an irregular surface. Even in fairly ventilated and open houses without any overcrowding, occasional plague cases have occurred in attic rooms, *e.g.*, in house No. 28-30, Nishanpada Cross Lane, where four cases occurred ; all were in attic rooms—three on the second floor, and the fourth on the third floor. In house No. 178, Tordel Street, where three cases occurred ; all were on the third floor in attic rooms. In house No. 235-237, Nishanpada, every one of the cases occurred on the fifth floor garret. Further, out of 50 cases removed this year from Novroji Hill 2nd Road, 29 were found in rooms directly under the roof ; some of these rooms were on the ground floor, some on the first floor, and some higher still. This peculiarity of greater incidence of plague in attic rooms may be accounted for by the accumulation of dust, dirt, and filth on and about the roof harbouring the plague bacilli.

3. The largest number of plague cases is found in houses in which each room is let out as a separate tenement, and specially in rooms where there is overcrowding (the cubic space for each adult inmate being much less than 300 cubic feet). The incidence of the disease is most marked in dark, ill-ventilated, small rooms. I quite agree with Surgeon-Captain Thomson that the deficient supply of fresh air is a great factor in the spread of this disease, and that it is not primarily a filth disease.

4. In my opinion the dead bodies of persons as well as animals affected with plague are infectious. In fact, there is as much danger in plague cases for a few hours after death as for the last few hours before death. As a proof of this view several cases are on record where people have caught infection from attending a plague funeral, or from sleeping in houses where dead rats were found. I learn from my friend Dr. Katrak that a few weeks ago, in a Parsi house on Frere Road, a dead rat was found in some stored-up grain; the rat was taken out and burnt, and the grain sifted before further use. All three persons present at the time of sifting the grain (a process in which a quantity of dust is raised) got the plague. I should like to know whether Surgeon-Captain Thomson still holds the opinion expressed in his Parel report, that "the body of a patient dead of plague does not seem to be capable of communicating the disease."

5. It is also noticed that, even after exposure to infection, those who live in open, well-ventilated places escape the disease, while others living under reverse circumstances fall victims to it. As an instance, last year dead rats were found in the Chemical Analyser's laboratory, and in all probability all persons working there were infected, but only two servants got the plague, while all others escaped.

6. My experience is similar to Surgeon-Captain Thomson's as to the recurrence of plague in disinfected houses; and I think he is right in saying that very little confidence can be put in chemical disinfectants. Further, I am inclined to believe that lime-washing in the long run, as soon as the effects of disinfectants pass off, favours the development and multiplication of plague bacilli by affording a suitable alkaline medium for their growth. For instance, the house No. 107, Naoroji Hill 1st Road, was evacuated with the exception of two persons—an old woman and a child $2\frac{1}{2}$ years old; the house was then disinfected and lime-washed. The child, to the best of my enquiry, never left the house but still got plague and died three weeks after disinfection of the house. Dr. Stewart from Jalgaon writes that three white-washers were attacked with plague there. I should like to know from Dr. Thomson whether lime-washing formed a part of disinfection of houses in Satara.

7. Dampness appears to have very little effect in determining the occurrence of plague. Out of 50 cases removed from one street, only 11 occurred in rooms near water taps. On the contrary, I believe,

moisture retards free movement of plague bacilli by settling dust on the ground, and thus checks the spread of disease. In support of this theory I may mention the decrease of general mortality, and therefore of plague, by more than 50 per day for three days from 16th to 18th February, consequent on a shower of rain on the 9th February, allowing seven days as time for incubation and disease-period.

8. Surgeon-Captain Thomson said that there were no drains or sewers in Satara, and still the disease prevailed. I am also of opinion that this disease is not influenced by any effluvia from drains, sewers, *nahnis*, *moris*, privies or urinals, more than the fact that the alkalinity of ammonia may favour the growth of the bacilli. On the other hand it is quite natural that the higher organisms present in drains and sewers may tend to destroy the plague bacilli, and thus have some salutary effect on the spread of plague. It is a noted fact that out of over a thousand labourers employed in cleansing Bombay sewers from day to day only one was attacked with plague. (*Vide* Mr. Snow's Report, page 4.) Again, in *Bhungies* chawl in Omerkhady Road, which is overcrowded and ill-ventilated (there being 114 rooms of 1,000 cubic feet capacity each and 471 people living), although plague appeared, it spread but very little indeed, without even the usual measures of the isolation of the sick and segregation of contacts.

9. I then referred to the desirability of almost open-air treatment of plague, the same as advocated by some in cases of typhus, and urged for much larger cubic and floor space being allowed for each patient in hospitals in Bombay than that usually recognised.

On the motion of Dr. Temulji Bhicaji Nariman further discussion was adjourned till Friday, the 25th instant.

MONTHLY MORTALITY OF SATARA CITY, 1892—1898.

| Month. | | | | 1892. | 1893. | 1894. | 1895. | 1896. | 1897. | 1898. |
|-----------|-----|-----|-----|-------|-------|-------|-------|-------|-------|-------|
| January | ... | ... | ... | 76 | 40 | 66 | 45 | 50 | 45 | 316 |
| February | ... | ... | ... | 51 | 40 | 48 | 75 | 60 | 60 | 117 |
| March... | ... | ... | ... | 69 | 46 | 66 | 70 | 51 | 75 | |
| April ... | ... | ... | ... | 58 | 53 | 50 | 57 | 71 | 118 | |
| May ... | ... | ... | ... | 44 | 44 | 134 | 62 | 148 | 99 | |
| June ... | ... | ... | ... | 54 | 56 | 66 | 76 | 60 | 109 | |
| July ... | ... | ... | ... | 88 | 62 | 53 | 98 | 84 | 163 | |
| August | ... | ... | ... | 66 | 80 | 68 | 87 | 85 | 117 | |
| September | ... | ... | ... | 71 | 59 | 53 | 99 | 67 | 127 | |
| October | ... | ... | .. | 53 | 80 | 58 | 73 | 73 | 123 | |
| November | ... | ... | ... | 64 | 58 | 52 | 91 | 71 | 131 | |
| December | ... | ... | ... | 48 | 52 | 46 | 94 | 61 | 246 | |
| Total ... | | | | 742 | 670 | 760 | 927 | 881 | 1,413 | |

PLAGUE IN SATARA CITY.

| Months. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | REMARKS. | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|
| 1897. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| January ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| February ..A | 1 | .. | .. | .. | 5 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| March ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| April ..A | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | *1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| May ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| June ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| July ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| August ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| September ..A | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| October ..A | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | 2 | .. | 2 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| November ..A | .. | .. | .. | .. | 1 | 1 | 1 | .. | .. | .. | 4 | 5 | 5 | .. | .. | .. | .. | 1 | .. | .. | .. | *2 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| December ..A | 2 | .. | .. | .. | 2 | .. | 3 | .. | 4 | 3 | 4 | 1 | .. | 6 | 4 | 5 | 2 | 4 | 7 | 11 | 9 | 7 | 11 | 17 | 14 | 5 | 19 | 11 | 11 | 18 | 9 | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| 1898. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| January ..A | 12 | 14 | 11 | 13 | 7 | 14 | 7 | 9 | 14 | 14 | 18 | 18 | 14 | 11 | 13 | 14 | 12 | 8 | 14 | 14 | 14 | 10 | 7 | 7 | 14 | 15 | 11 | 10 | 8 | 5 | 1 | .. | .. | |
| " ..D | 2 | 5 | 3 | 2 | 1 | 2 | 2 | 1 | 4 | 4 | 2 | 2 | 5 | 1 | 5 | 4 | 1 | 5 | 4 | 1 | 5 | 4 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | .. |
| February ..A | 9 | 7 | 8 | 5 | 7 | 8 | 8 | 6 | 4 | 10 | 14 | 14 | 8 | 6 | 7 | 11 | 11 | 8 | 10 | 10 | 6 | 3 | 3 | 11 | 7 | 13 | 10 | 4 | 6 | 4 | 4 | .. | .. | |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | |
| March ..A | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | .. |
| " ..D | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |

Out = Deaths out of Hospital.
† Deaths in Hospital.
Difference between "out" and total D = Deaths in Hospital.
2 out
8 = in Hospital. } Total Deaths D = 5.

A = Attacks.
D = Deaths.
* = Imported.
† Indigenous.

S. W. S. THOMSON, Surg.-Capt., I.M.S.

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

AN Adjourned Meeting of the Bombay Medical and Physical Society was held in the University Hall on Friday, 25th March 1898, at 5-15 P.M.

In the absence of the President, Surgeon-Lieut.-Col. J. W. Clarkson was voted to the chair.

Present : Dr. A. H. Deane, Dr. T. Blaney, Surgeon-Capt. C. H. L. Meyer, Staff Surgeon P. W. Bassett Smith, R. N., Bde.-Surg.-Lieut.-Col. J. S. Wilkins, Surgeon-Major H. P. Dimmock, Dr. N. N. Katrak, Dr. Ismail Jan Mahomed, Dr. (Miss) Gertrude Bradley, Dr. (Miss) Benson, Dr. F. Pearse, Staff Surgeon A. M. Page, R. N., Dr. (Mrs.) Water, Dr. S. Nariman, Dr. Marsh, Dr. Beach, Dr. (Miss) Carthorn, Dr. Temulji Bhicaji Nariman, Dr. P. Lisboa, Dr. D. R. Bardi, Dr. R. M. Kalapesi, Dr. W. W. Pitchford, Dr. H. H. Knapp, Dr. Jameson, and Surgeon-Capt. H. Herbert.

Business :—

The discussion on Surgeon-Capt. C. H. L. Meyer's and Surgeon-Capt. G. S. Thomson's papers was resumed.

SURGEON-CAPT. J. B. SMITH, Acting Civil Surgeon, Poona, sent the following remarks, which were read by the Secretary :—

In the proceedings of the Bombay Medical and Physical Society for February, Surgeon-Capt. Meyer makes a reference to Karad, which is entirely misleading. He says : " To appreciate fairly the value of the measures which were taken, one should draw a comparison between the plague mortality in such a case as the above where the people were compulsorily moved out of the infected quarters and the death-rate in an instance such as that of the village of Karad in the Satara

District, where this was not done." The comparison obviously intended is that of plague measures *including* as against plague measures *excluding* evacuation of the people. But the two cases admit of no comparison. Hubli was taken in time, before ten plague deaths had occurred; in Karad the epidemic was concealed for probably two months, possibly more, and the town was thoroughly infected all through before any steps were taken to check the disease.

A sketch of the plague history of Karad, as far as is known, may be interesting to the members of the Society. In the end of January or beginning of February, Mr. Young, of the Survey Department, reported that there had been cases of plague in various villages in the Karad Taluka including Karad itself. That these cases died out leaving no infection is not in accord with the known history of plague. Where these cases came from is unknown. I think it not unlikely that they were due to the return of Karad labourers who had, on account of the famine, gone to Bombay to seek work. That there was some cause at work increasing the mortality may be inferred from a comparison of the mortality in the town in 1897 with that of the mean of the preceding five years:—

| Months. | | | | | | | Mean of 5 years 1892—96. | 1897. |
|-----------|-----|-----|-----|-----|-----|-----|-----------------------------|-------|
| January | ... | ... | ... | ... | ... | ... | 21·6 | 30 |
| February | ... | ... | ... | ... | ... | ... | 20·6 | 18 |
| March | ... | ... | ... | ... | ... | ... | 21 | 30 |
| April | ... | ... | ... | ... | ... | ... | 21·2 | 40 |
| May | ... | ... | ... | ... | ... | ... | 45 | 108 |
| June | ... | ... | ... | ... | ... | ... | 48·6 | 52 |
| July | ... | ... | ... | ... | ... | ... | 24·8 | 213 |
| August | ... | ... | ... | ... | ... | ... | 29 | 730 |
| September | ... | ... | ... | ... | ... | ... | 24 | 313 |
| October | ... | ... | ... | ... | ... | ... | 26·2 | 62 |
| November | ... | ... | ... | ... | ... | ... | 25 | 29 |
| December | ... | ... | ... | ... | ... | ... | 29 | 26 |

"Cholera" was officially notified on the 1st May and plague on the 7th July, and Surgeon-Lieut. Kukday, who was the first commissioned medical officer on the scene, was of opinion that what was notified as cholera was in reality plague—the vomiting and diarrhœa which so often usher in plague being mistaken for cholera. Surgeon-Lieut. Kukday had exceptional facilities for forming an opinion owing to

his intimate knowledge of the language and people. Surgeon-Major Baker, who visited Karad in the end of August, was of opinion that the fall in the mortality in June was due to concealment of plague deaths. It may be asked, how was it possible for plague to exist in a taluka headquarters town without the mamlatdar and hospital assistant knowing? Still it is what happened. A native christian missionary, a month before plague was notified, stated in a letter to the collector that it existed. The mamlatdar of a neighbouring taluka had, before the 26th May, heard that plague existed in Karad, and proceeded to take steps to prevent its entrance into his own taluka. The local officers denied the existence of plague, and brought the Municipality mortality statistics to prove there could be none.

It will thus be seen what a hold the disease was able to get on the town.

A plague hospital was opened on the 13th July under a hospital assistant, and a plague flying column arrived on the 29th July. On August 28th, Surgeon-Major Baker visited the town, and his visit was the turning point in the epidemic. The mortality reached its highest in the week ending August 30th, when there was an average of 35·3 attacks daily, and on the 24th August there were no less than 57 attacks! From this week the attacks went steadily down, and in four weeks the daily average of attacks was down to less than six daily and in eight weeks to less than one daily. Surgeon-Major Baker's visit was followed by increased staff and increased activity in all directions. Coolies, who were not obtainable locally, were sent from Bombay. Search parties went more systematically to work, disinfection followed close on the heels of infection (the arrears of infected houses being allowed for the time to go largely by the board), and was more thorough than it had been when coolies were too few for the number of the infected houses. The other measures taken in Karad Town comprised the usual observation and segregation camps and hospitals. In addition, the general disinfection of the town block by block—each block comprising the dwellings within four streets—was put in hand on 26th September, and is now approaching completion. This measure was necessary owing to concealment of the early cases, to the moving of cases from house to house, and to the fact that rats carry the plague. The success which had attended Dr. Dyson's general disinfection at Bulsar led me to hope it would be successful in Karad, and I think I may claim that it has been.

I think from the above account it will be seen that the circumstances at Karad were very different from those at Hubli. In Hubli there were 35 cases all told ; in Karad, the week before I went there, there were over 35 cases a day. In Hubli the people affected were railway employés and under considerable control ; the people at Karad were subject to a punitive police post owing to a threatened attack on the assistant collector. In Hubli the whole of the Dharwar district and the railway workshops and staff were at the disposal of the plague column ; in Karad it was almost impossible to get hospital sheds erected owing to the panic. There were apparently police in plenty and to spare at Hubli ; at Karad we never had sufficient. The Hubli outbreak took place in the dry weather ; the height of the Karad one was in the rains, when everything was soaking wet. The Hubli epidemic was confined to a very circumscribed area ; all the villages round Karad were blazing with plague. Hubli had thus to take no thought for people trying to come in with plague on them ; our greatest difficulty in Karad was this. In Hubli, dry weather accommodation had only to be found for 1,200 people, close to a line of railway ; in Karad, four miles from the railway, with an unbridged river in flood between, monsoon accommodation would have had to have been provided for at least half the nominal population, *i.e.*, 6,000 people. Such accommodation would tax Bombay City and could not have been provided in six weeks, by which time the epidemic was nearing its termination.

It will thus be seen how totally different were the cases of Hubli and Karad. One is the history of an epidemic treated with promptitude ; the other that of one concealed at first and, when discovered, dealt with with insufficient staff.

This must not be taken as a counterblast against evacuation. Even before Surgeon-Major Anderson's recommendation was printed in a Government Resolution, I had been advocating evacuation as strongly as I could for the villages ; but, unless one had had the power of Alladin's lamp, one could not have got the necessary accommodation up in time for it to have been of any real use in Karad Town. If it had been started in July, accommodation would have had to have been provided for 10,000 people at least. When I went early in September, labour to build the necessary segregation huts was with difficulty procured.

Evacuation seems to be the only real remedy for plague in the villages, as is strongly borne out by the experience of the Karad Taluka. With the onset of the fair weather the case-rate went down rapidly, because the people were then able to go out to live in the fields. There is, however, one very serious danger in turning the people indiscriminately out into the fields, and that is, that they may (and almost certainly will in wet weather) pass on to other villages, taking the plague with them. Dr. Robertson's plan of dealing with a village is very simple and was eminently successful in the only village Belavada, where it was possible to carry it out in its entirety. He had a small hospital (with an observation camp attached) close to the village. Through this camp he passed all the villagers into their fields, disinfected the town, and re-admitted them through the observation camp again. The first passage through the observation camp was to prevent them carrying plague out to other places; the second to prevent anyone bringing it back. But police are necessary for this measure, and of police we were always short.

This re-admission of people into the villages through observation camps has not been carried out in the other villages for various reasons, though strongly advocated for all by Dr. Robertson. It will be interesting to see whether the monsoon will be followed by a recrudescence in their villages. In dealing with villages, the distinction between purely agricultural and commercial villages is of importance—it is comparatively easy to get the inhabitants of the former out into the fields, and they have little or no inducement to wander to other villages. In the case of commercial or manufacturing villages, on the other hand, the inhabitants dislike going into the fields, and they have a tendency to wander to other villages.

It is extremely difficult to deal with plague-infected villages in the rains. Evacuation, so easy to arrange for and enforce in the dry season, is practically impossible in the rains owing to the difficulty of providing watertight shelter and the prohibitive cost of it, even if it were procurable. Dr. Robertson's plan seems the most feasible here, for the people he discharged from his observation camp might safely go to other villages. I am speaking, of course, of an epidemic which affected about fifty villages.

One of the greatest difficulties in village plague work is the want of efficient supervision. Disinfection done by plague mamlatdars, circle

inspectors and such like is, I believe, hardly ever trustworthy. They are mostly afraid of the disease, and are fond of going about with a lump of camphor up to their noses. It fell to my lot to instruct a fair number of these men, and I got a very distinct impression that the less contact they had with plague houses, the better they were pleased. Furthermore, they do not understand the *rationale* of the process, nor do they appreciate, as a rule, the immense importance of thoroughness. Besides, the lowlier paid of the native agencies are subject to great temptation at the hands of well-to-do householders. At the last I came to distrust everybody—almost even Eurasian and European plague inspectors. Even where no worse motive entered in, they were often careless. As Surgeon-Capt. Meyer remarks, nothing but the most “unresting supervision” will ensure success. The most trustworthy of all the subordinates working under us were the hospital assistants. For my own part, I think it would be well to have a standing order everywhere that in every village where plague occurs, the infected houses should be immediately and completely unroofed—not simply taking the tiles off, but removing the rafters or grass, and so allowing the sun and air free access to the house. This plan would have many advantages; it could be done *at once* by local labour and without any special appliances. A supervising officer could see it had been properly done at any time afterwards. This is not so with disinfection. If the occupants refused to clear out of the house, as they often do when there are no police to force them, they would not be likely to take much harm in an unroofed house. Disinfection of the village could follow later under the personal supervision of a responsible officer.

In Karad reliance was placed entirely on sublimate solution as a disinfecting agent. There was, at least in my time, no subsequent whitewashing. Lime water precipitates yellow oxide of mercury from a solution of corrosive sublimate. When the disinfected room dries, only the water evaporates, and a certain amount of perchloride of mercury remains in the walls, ready, if damped, to become again potent as a germicide. On whitewashing, this perchloride becomes converted into yellow oxide, and so inert. Besides, if the spraying has been done efficiently, there ought to be no need for further disinfection of any kind. And the fact that a second process of disinfection is gone through may lead to carelessness in the first—coolies and others perhaps assuming that the second will make up for any defect in the

first. If not necessary, whitewashing is a waste, not only of money, but also—which is often perhaps more important—of cooly labour, when coolies are hard to get.

Surgeon-Capt. Meyer makes a further mistake in the mortality he ascribes to plague in Karad town. The actual figures given by the Municipality are appalling enough without any exaggeration. The total mortality for the year was recorded as 1,651 from all causes. If from this we deduct 327, the average mortality, we get 1,324, which may fairly be credited to plague. This is about half the mortality assumed by Surgeon-Capt. Meyer.

STAFF-SURGEON BASSETT SMITH said :—

Having only just returned to Bombay, I had not the pleasure of being at the last meeting, when Surgeon-Captain Thompson's paper was read ; but in the copy which has been presented me here, I was very interested in reading his remarks about the floating population and the immunity that abundance of fresh air gives to them. This is the more interesting to me, as on two occasions a single case among the natives has been attacked in the "Tenasserim," one in each epidemic. These were quickly removed to hospital, and the part of the ship was then well scrubbed with disinfectants, &c. On *neither occasion has there been any spread* of the disease. This is an important and reassuring fact in view of the case occurring on board the P. & O. lately.

DR. N. N. KATRAK said that he rose to address the meeting in deference to the wish of the Chairman, but he did so with great diffidence, as he had not had the large experience of the management of plague possessed by the speakers who had preceded him. He said that his position as a sanitary member of the Bombay Municipal Corporation had, however, compelled him to carefully study all that was passing about him, and his remarks were from the point of view of a practical sanitarian, who could not afford to wait till everything about plague or any other epidemic was known and who had perforce to take prompt action in some direction to combat the disease anyhow. His observations for the last year and-a-half had forced upon him certain conclusions—of course of a tentative character—which he placed before the meeting. He said that their knowledge about plague was very unsatisfactory ; the only thing certain about this disease was that it was due to the bacillus of Kitasato ; that it was an extremely fatal disease ; and that, for all practical purposes, the period of incubation

might be safely taken at from ten to twelve days. Beyond these, everything was vague and uncertain. There was no warrant, he said, for the opinion that it was a filth disease or that it was due to overcrowding, insufficient ventilation, dampness or to sewer-gas, and said that it was equally unsafe to assert the contrary. Some said that the plague bacillus thrived best in damp and filth, while others had said at this meeting that in some cases the contrary was the case. Practical sanitary measures could not be based on such insufficient data. All the same, however, all those and other insanitary conditions required to be promptly removed, if it was sought to combat plague or any other epidemic with anything like success. Experience had shown over and over again that without the removal of insanitary conditions of a place, very little could be done in the direction of combating epidemics. Besides, there were experiments which went to show that those measures rested on sound scientific basis. It had been experimentally proved that animals who were made to inhale sewer-gas and then inoculated with disease-germs caught the disease in larger proportion and died in greater number than those similarly treated but who were not made to inhale sewer-gas. This clearly warranted the conclusion that emanations from unhealthy surroundings, such as sewer-gas, overcrowding, insufficient ventilation, &c., produced, in the animals exposed to such influences, certain changes, which predisposed them to catch infection, and also reduced the chances of recovery in those affected. There were two factors in germ-diseases, *viz.*, the germs and the human constitution. From the above view it was clear that the efforts of the practical sanitarian should not be solely directed towards the eradication of germs, which was generally, but more so in a disease like plague and in a vast city like Bombay when once the disease had spread widely, like a wild goose chase; but he must also adopt measures which would enable human constitutions to resist the inroads of the disease. If those measures rendered the germs less active or less virulent, all the better, though he (Dr. Katrak) for his part believed that the knowledge about the life-history of the plague-germs is too meagre and too conflicting to enable one to speak with confidence on such points. Last year these measures, *viz.*, the measures for cleaning the city by flushing the drains and sewers, more active surface conservancy, the removal of tiles, lessening of overcrowding by encouraging exodus, camping in sheds and huts, &c., were carried out more energetically and on a wider scale, and he was sure that that was the proper thing to have done. But he was surprised that during the present epidemic those

measures were not given the same importance, and the efforts of the plague authorities were mainly concentrated upon the annoying and harassing measures of detention, quarantine and segregation—measures which were always difficult of application even in the beginning and in small places, but which were almost impossible and, therefore, almost useless in such a vast city and when plague had once spread over a large area.

As regards disinfection, he said he did not agree with those who took a despondent view of it, *viz.*, that disinfection was inefficacious or useless in plague-infected houses; their ground for this opinion being that cases did occur in those houses after disinfection. He, however, believed that thorough disinfection was possible, if strong carbolic or perchloride of mercury solution, or strong chlorine solution in the shape of chloride of lime or chlorine gas, or hot lime were properly used. These articles had been found to destroy other germs, and he did not know that there was anything special about plague-germs that those articles should fail. If cases did recur in disinfected houses, it might be that disinfection was not thorough; but a more rational explanation in cases in which there was no ground for saying that disinfection was not thorough, was that a house which was vulnerable to infection once was also vulnerable to re-infection for the second or third time as the case might be. Hence, according to his view, the recurrence of cases in thoroughly disinfected houses simply implied the possibility of re-infection rather than failure of disinfection. The measures above referred to, he said, would be applicable to all epidemics. But there was a special feature in plague which required to be carefully considered. It was the part played by rats in plague epidemics. Opinions might differ as to the exact part played by these rodents in propagating the disease. But that the part played by them had some significance; and, according to his idea, great significance, there could be no doubt; yet, in the programme of the measures for the suppression of plague, dealing with those rodents in any way did not, strangely, find any place at all. Dr. Katrak said that a plague-stricken man might and did infect a locality, but his power of infecting other persons directly was extremely slight. If his discharges directly touched an absorbing surface like the mucous membrane or cracked skin, perhaps the infection might take; but, in his opinion, man as a propagator of plague on an extensive scale, as occurred in a plague epidemic, was not an

important factor. He said he was inclined to believe that man primarily infected rats who took the infection from his discharges, and the poison in passing through the bodies of those rodents probably became intensified. The infected rats thereafter scattered the poison broadcast in houses through their discharges, sometimes giving warning to men of the approaching danger when found dead. The above view, in his opinion, harmonised with the common observation forced on the lay as well as professional minds, to the effect that, though imported cases might occur one after another in a locality the true indigenous cases appeared (*i.e.*, that locality was seriously affected) simultaneously with, and in many cases after, the appearance of dead rats in that locality. He said that a practical sanitarian would be acting in the right direction if he acted on the theory that those rodents were the chief, if not the sole, propagators of the plague. It was those rodents who infected a house for the first time where no previous case had occurred. It was they who re-infected a house which had been thoroughly disinfected after the first infection—a fact which puzzled some, and led them to believe that disinfection was inefficient. He was surprised that neither in Bombay nor in other infected localities out of it any attempts had been made either to destroy or to deal somehow with those rodents. He admitted he had no executive experience, and therefore he did not know how to deal with them; and he was aware of the many difficulties in the way of such a measure. But making all the allowance for such consideration, he failed to understand why so little importance was given to this most important factor. He, however, hoped that as experience increased and the knowledge about the part played by those rodents became more definite, the necessity for dealing with them will be forced on those who undertook the work of suppression of the plague.

This naturally led to the consideration of the question of the segregation of the sick and the healthy. Experience had proved that plague-stricken patients were not so dangerous to others as was assumed in the beginning of the first epidemic, when the knowledge about the whole subject was so scanty. One could not understand why if a plague-stricken patient was so dangerous to others while at home, he should become less so, or almost innocuous the moment he was removed to hospital, which may be the very next house to where he got the disease. An extremely small percentage of the hospital attendants had caught the infection, though the building contained

not only one, but a large number of plague patients—a circumstance which, in the light of experience of epidemics of other diseases, such as small-pox, ought to have intensified the poison. Even of those affected (*i.e.*, hospital attendants), Dr. Katrak did not know whether attempts had been made to find out if all, or some at least, did not get the infection from outside the hospital buildings. At any rate, if a plague patient was a danger to the other inmates of the house, he was so only in a slight degree. In the majority of cases, if not in all, if the inmates caught the infection subsequently, it was, he believed, from the same source from which the first person infected got the disease; only the time of infection was later or the incubation period longer. From the above considerations and from the rat theory given above Dr. Katrak thought that, instead of concentrating all the attention to the removal of plague patients to the hospital and giving a secondary importance to the removal of the healthy and vacating of houses, it would be more rational and more scientific to reverse the order, *viz.*, to concentrate all efforts to remove the healthy till such time as the house or the room was disinfected, and to give a secondary importance to the removal of the sick to the hospital, and, under certain circumstances, to leave the sick to be treated in the house till he recovered or died, provided proper arrangements could be made to disinfect that house and that the sanitary condition was good. Of course, in insanitary houses, where even ordinary illness could not be treated with advantage to the patient or, on the score of convenience, to the other inmates, removal of the sick to the hospital would be a humanitarian procedure to adopt. But there were good and sanitary houses in which proper arrangements could be made to treat the patients who would, no doubt, be the better for not being removed to the hospital. He hoped he would not be misunderstood. He was not opposed to the removal of the sick to the hospital. He was opposed to the wholesale and indiscriminate dragging of the patients to hospital, because he believed that in many cases it was a useless measure, and in some cases positively injurious, as the plague patients required complete rest, and the physical exertion and the mental excitement and agony no doubt reduced the chances of recovery.

DR. PEARSE said :—

Perhaps I may be permitted to offer a few remarks on the contagion of plague. It is not so very long ago that other infectious diseases, *viz.*, typhoid, small-pox, scarlet-fever and measles, were thought to

be filth diseases and capable of being generated wherever filth and insanitary conditions existed. Now, it is recognized that each of these diseases possesses a specific contagion and can only arise when the particular contagion is present. However bad, therefore, the habits of the people, or however insanitary the dwellings in which they live, we must bear in mind that these are conditions which only predispose to infection, by a general lowering of the health of the population or of the individual tone of the system, and do not without the specific agent produce the disease. Our efforts must be directed to the destruction of the specific poison. Now it is generally recognized that plague compared with other zymotic diseases is only slightly contagious. This is proved by the slight liability of attendants on the sick to take the disease, and by the rapid reduction of an outbreak when people are removed from their infected dwellings. This experience shows that the conditions of life within doors very greatly favour the development of the disease. This primary inference is supported by the repeated observation of the occurrence of case after case of plague in the same house even after it has been thoroughly disinfected. It would seem, therefore, that, differing from the other zymotic diseases mentioned, plague is not exterminated from a house by the ordinary methods. This has been explained by assuming that rats and other animals are the carriers of contagion. In support of this theory we have the observations that illness and death among rats have repeatedly occurred in houses shortly before plague has attacked any of its occupants. There is also the fact that cats and even ants are known to be affected by this disease. Knowing also that some of these animals survive this infection and, while immune themselves, live to propagate other generations of animals which are capable of contracting the disease, we can appreciate the difficulty of exterminating the disease and see perhaps some explanation of its continued recurrence. Reviewing all these points, we can understand how it is that the measures adopted for treating an epidemic have not been successful. Hitherto plague has been looked upon as a disease like scarlet-fever, measles, or small-pox which is propagated from one person to another and little or not at all by any other agency. We have learnt, however, of recent years that scarlet-fever, diphtheria, and other infectious diseases can be propagated by other additional channels, *viz.*, through contaminated food and also by infected animals. We are justified, therefore, in the case of plague in making further enquiries into this means of spread, and to so modify our operations that while we take every precaution against

the spread of contagion from the sick to the healthy, we do not overlook other means of communication. The records show that not more than five per cent., and probably very much less, of those exposed to the contagion of a case of plague contract the disease, which seems to indicate that we must in future adopt measures to destroy the contagion from other sources (than that from one individual to another) if we are to be successful in eradicating this disease.

DR. ISMAIL JAN MAHOMED said :—

I shall feel obliged if any of the members present will inform me if it is possible that fomites and dirty linen, soiled with the discharges of patients, are or are not the causes of the spreading of plague. I have noticed the recrudescence of plague in houses which were thoroughly disinfected, and I think this is due to the tenants bringing with them, when they come to occupy the house, dirty soiled linen which infects the rats and then the rats spread the disease. I don't agree with the opinion that all plague cases should be allowed to be treated in their own houses, for, as it is, poor people in their houses are not at all careful about taking care of the discharges of the patient, and they take care to store and save as much of dirty linen as they can; and it is the opinion of scientific men that this soiled linen, even after a long time, is the cause of the spread of disease. I think it is dangerous to give out that plague is not a contagious disease, or only five per cent. contagious, as Dr. Pearse says. It has not been ascertained in what proportion plague is contagious, but I think in many instances it is certainly more than five percentage contagious, and therefore I would not condemn quarantine and segregation wholesale, as some others have done. Properly enforced, they are very useful measures. Dr. Katrak and Dr. Pearse recommend other measures in preference to segregation and quarantine. I should have liked to hear from them what measures they would recommend. It has been also said that rats spread the disease, but up to this time nobody has tried to show how rats communicate the disease to man by direct inoculation, or by diffusing the poison in the air or any other mode. It is admitted on all hands that rats are the cause of the spread of disease, but it is not known in what way they spread the disease, or it would be useful to warn the people how to avoid infection from rats. My experience is that, primarily, the disease is communicated to rats either by fomites or the discharges from human beings; and in some instances plague cases occur immediately after dead rats are found, in others after three or four days.

SURGEON-MAJOR H. P. DIMMOCK spoke as follows :—

It is difficult to deal concisely with the many questions that arise in a discussion like the present and at the same time to enter fully into matters connected with the epidemic of plague now prevailing in Bombay. The object of the discussion is, however, to gain some expression of opinion as to the best way to deal with the epidemic, and therefore, in the presence of such a meeting as this, it is required to state emphatically what are the right measures to uphold from a sanitary and medical standpoint (for this, after all, is the most humane principle on which to work), and all political and utilitarian side-lights should be evaded in a professional exegesis of such decided opinions.

Now the method by which an epidemic of plague extends must be the basis upon which we ought to found our preventive and other measures, and those who have a close familiarity with the disease are aware how true it is that it extends under circumstances which admit of no denial as to its contagious nature and also that it is infectious, especially in the pneumonic type of cases.

All of us who have observed the disease know how it extends in ever-widening circles which develop from infectious centres, and also what a remarkable feature of the disease is the somewhat slow, but very certain, extension from individual to individual.

It has been the commonest experience to note a case of plague occurring in one of the crowded dens of a Bombay chawl, and to see how invariably the relations and attendants on the case within the den would contract the disease and die at the rate of 80, 90 or 100 per cent. So, too, the disease has been seen to spread amongst the whole inhabitants of the chawl, which number several hundreds. Thus the circles of infection spread and extend their radii until they meet, and extensive regions of dwelling-houses are involved in one wide epidemic.

The evidence is conclusive that the epidemic especially spreads by contagion from human being to human being, and further that the positive sequel of a plague case is the infection of the house which becomes thereby a permanent source of danger of infection ; so, by the multiplication of plague cases, there is an enormously increased danger from the number of houses that will become infected.

Moreover, the virus is infinitely more tenacious than has been admitted by the numerous scientific authorities, for it lurks in holes and

corners of the dwelling-places for many months together, provided it finds the favourable conditions of its local habitat of rich moist organic matter associated with an absence of disintegrating conditions of sunlight and fresh air.

We have a scientific analogy in the methods that are pursued in Professor Haffkine's laboratory in the cultivation of the microbe for the purposes of inoculation. Professor Haffkine has found that when the microbe is placed in a suitable medium, *viz.*, peptonized broth and in a dark room, the bacillus will grow *ad infinitum*, and will multiply enormously until it has exhausted the nutrient medium; and this it will continue to do for six months or more as long as it has material in which to grow.

If this is the case in artificial media, how much more will it occur when the habitat is a naturally selected one and the conditions naturally favourable?—the body of a rodent that lives in darkness, the body of a human being who dwells in a small, dark, crowded room that reeks with organic excreted material, and the room itself all furnish soil which is essentially favourable to the growth of the bacillus in *statu naturæ*. Such views are widely different from the experimental demonstrations of eminent bacteriologists, but they are based on the fruits of a long practical and terrible experience. Bacteriological experiment will show that the bacillus will live in this and that medium or material for a certain number of days, but there is no count made of the effect of change of soil, of the exposure to light and air that is involved in the transference, and of other factors which must have incalculable influences on the life of this mysterious parasite.

In the practical and every-day work amongst the plague-stricken we have recorded instances of persons and their effects carrying infection for a long period of time, and of houses being the cause of disease long after the time when they were originally infected and when disinfection has been imperfect.

If, on the contrary, persons, effects and houses have been thoroughly disinfected and cleansed, these results of infection do not follow, and the houses can be re-occupied with impunity. At the same time it is not always possible to be quite sure of the complete disinfection of all places, and the latrines and bathing places and imperfect drains are, I believe, especially liable to harbour the virus for a long time.

Further, we know that if people leave an infected house and pass into conditions unfavourable to the development of the bacillus, the epidemic will stop in a few days. A few cases may develop at first even in one of the health camps ; but if these are carefully eliminated and treated, there will be no further recurrence.

Also we know that if the people return to an infected house that has not been treated, the disease will most surely re-appear amongst the occupants.

In towns and villages if the people flee, the epidemic begins to recede rapidly ; and if no measures are taken to get rid of infection, the epidemic will certainly rise again on the return of the inhabitants. These are facts that have been closely associated with the epidemic in Bombay both in 1896 and 1897, for the people have fled from Bombay carrying infection with them, and the mofussil towns and villages have had to suffer accordingly. The exodus left many houses in Bombay infected, and when plague rose in the outlying towns and villages, the people returned to Bombay, where the epidemic had waned, bringing back infection with them again and returning again to their infected houses. This is why the second epidemic was more difficult to deal with than the first, because many houses had been previously infected without the fact being known owing to defective organization, and many known infected houses had been imperfectly treated. This process will go on until the inhabitants have learnt how to avoid the sources of the disease or have become immunized by attacks of plague, or by artificial inoculation. The latter is a matter of wide interest, but it must be evident that it is, after all an auxiliary measure of limited application, as the effect of inoculation only lasts for a few months, and will have passed off in many before the rest of the people have been inoculated. That it is of the greatest service in localized epidemics I acknowledge, but it is an unpleasant process and cannot be expected to find favour amongst the unintelligent or for any prolonged period of time. In his excellent and able lecture Dr. Meyer laid particular stress on the agency of fire as a means of getting rid of infection, and, no doubt, it is the most effective agency possible ; but it cannot be applied extensively in a large city, although it was strongly upheld by some enthusiasts in the early days of Bombay plague. In fact, the only way to treat plague rationally, and on the approved principles of medical and sanitary science, is to follow on the lines indicated by a study of the practical features of the disease and

its epidemics. First and foremost, of course, would come the sanitary renovation of the whole city. This must be at the foundation of all other measures which, after all, can only be for the temporary arrest of the terrific mortality that will ensue if the *laissez faire* policy is pursued.

What must be done?

It is absolutely essential that (1) the people should be spread out so as to expose them to abundance of light and air, and remove them from insanitary and infected quarters; (2) the sick must also be separated from the healthy and placed in proper hospitals; (3) those who have been in contact with the sick must be placed in approved segregation quarters for a certain period of time until plague cases cease to appear amongst them; (4) the clothes and belongings of the sick and their contacts must be properly disinfected; (5) the infected houses and their property must be thoroughly disinfected and allowed to stand empty and exposed to light and air for some considerable time.

These are the great principles of the treatment of plague under a civilized *regime* and in a town or city or village. In a village or small town we can apply these principles to the fullest extent either with or without the co-operation of the people, for the whole of them can be marched out into temporary camps and the empty village taken in hand for complete renovation.

In a city it is difficult to carry out such measures even if the citizens *honestly* co-operate, and in Bombay, where they are largely hostile, the difficulties are enormous.

A great deal has been done and is being done in the establishment of Plague Hospitals, Contact and Segregation Camps, and Health Camps; a large organized staff for each ward to carry out the processes of detection of sick, removal of plague cases to hospital, transfer of contacts to a contact camp, removal of suspicious cases to a segregation camp, and the evacuation of large unhealthy areas of dwelling-houses, the occupants being located in a Health Camp while the whole series of houses and even streets have undergone thorough disinfection and sanitary improvement. Such has been the work of the Plague Committee in the face of enormous odds and with *no support* except the confidence of experience and knowledge in the task they have had to do. As the result of our operations we know that the disease stops at

once when people from an infected area are removed to a health camp, and the people soon learn to know it themselves ; we also know that a certain proportion of the contacts under observation in a contact camp develop plague within the first few days after admission, and during the month of January in the Wari Bunder Contact Camp, out of an average of between 300 and 400 per diem, over 50 cases of serious sickness occurred, of which half were plague cases. How many more of these contacts would have developed plague and spread the disease to others, had they been allowed to remain as contacts in their houses and not treated as such persons *must* be !

Anyone who knows anything about plague must recognize that these are the only lines on which to work for keeping down the epidemic in this city ; that to follow them, only stringency and the application of stringent rules will be of any use. If such measures had not been enforced by the responsible authorities during the recent epidemic, the mortality would most assuredly have been far greater than it has been, and that the measures have been effective is shown by a comparison of the actual mortality and the actual population in the several epidemics of 1896-97 and 1897-98.

A few words finally about the rat theory. I acknowledge that rats do infect houses and human beings, but I think that the epidemic is not spread to such a great degree as is imagined by these animals. Plague rats may infect a house and one or two human beings, but these human beings are a hundred times greater danger to the community than that of further infection by rats. Certainly, too, rats may start an epidemic amongst human beings, but I think that the appearance of plague amongst rats is very often an indication of disease having been imported by infected human beings or materials. The distances are often too great to account for infection by other rats. Moreover, the period of incubation and development of plague in rats is very short, while a human being may carry the disease in his system for several days and probably may be infective even then before he shows decided symptoms. I have often detected the incubation of plague by the appearance of the patient, and in house inspection have given orders for certain persons to be simply watched, and plague has appeared in them as suspected. Rats may die therefore in the region of an incubating plague case because they have been infected by it, and the development of plague in the human being subsequently would be wrongly attributed to infection by the rats.

Again, there is another class of human beings who are infective, and that is the convalescent, and in several instances in the annals of the Plague Committee cases have been examined bacteriologically, which have shown the bacillus in a discharging sinus after the patient has apparently recovered. Kitasato also found the bacillus in the secretions of a plague patient six weeks after convalescence, and it is possible that this class of cases may account for recrudescences of the disease in places like Karachi and Poona, which have been declared free of plague, being caused by convalescents from Bombay ; also in the same way original outbreaks up-country far from Bombay may be due to convalescents from this part of the country.

SURGEON-CAPT. THOMSON has replied as follows—

To Dr. (Mrs.) SLATER's question :

The people passed out through detention and observation camps, huddled themselves or camped on the *maidan* around the city, went elsewhere, or remained in our detention camps as they pleased.

In *re* SURGEON-LIEUT.-COL. CLARKSON's remarks :—

The incubation period, in my experience both at Satara and in Bombay (Parel), is under ten days, and most cases develop under six days' detention under observation. I have heard of one case nineteen days segregated, but the possibility and probability of the person's having visited an infected place during the interval was very strong. Wilm mentions only one case in Hongkong when the incubation period extended very likely to fifteen days. The latent interval between the first really imported case and subsequent general infection of a locality was in Satara, at three foci of infection, exactly five weeks ; in the Great Plague in London seven weeks. This I have referred to as due to the behaviour of the bacillus extra-somatically, and of which we are as yet wholly ignorant.

This is a gap in our knowledge, which we may hope will be filled up some day. I was engaged in the Municipal Laboratory, by Mr. Hankin's kind permission, on a research as to the virulence of the plague microbe 'involution forms' demonstrated by us, when the laboratory was closed by Mr. Hankin being recalled to Agra and my being transferred from Bombay. In this direction light will arise on this problem, and it is well worth the serious consideration of investigators with the time and apparatus at their disposal for such a research.

The relation of rats to plague I have referred to sufficiently in the paper. It is difficult to be sure that all rats have been disinfected properly or have been destroyed, or not been conveyed surreptitiously into camps of health or plague hospitals, and thus carry on infection thither, and hence also a further weak point in our disinfection by chemicals. Steam under pressure is the reliable artificial disinfectant.

As regards attacks and deaths by age periods, such a return is useless until one knows the number of persons at the different age-periods living and exposed to infection in the locality where an epidemic prevails, I fancy it is the old story of white sheep eating more than black sheep, *because there are more of them*; hence the greater number of attacks between, say, 12 and 35 years.

Dr. Nariman's remarks, in the main, confirm my views. The finding of most cases in chawls under the roof is a new fact to me. Perhaps, those patients are removed from the lower floors, where they were really attacked, in order to conceal them, or at any rate give more trouble to the search-parties going upstairs, &c.

It is certain, in my mind, wherever the means of ventilation are abused—by what means I need not particularize, either in the hovels of the poor (under the roof) or in the palaces of the rich—there plague is liable to break out. *Apropos* of this, note Commander Hewett's report on a good, roomy house in Bapty Road, where twenty cases of plague occurred in a single (windy and stormy) night, because the inhabitants shut up all the door and windows (*Times of India*, 5th March 1898, p. 6).

Dr. Nariman seems to have misunderstood my remarks. I suppose he refers to the immunity enjoyed by hospital servants who lifted the dead bodies. I never meant to convey that dead plague bodies were non-infectious. No, I wished to show that, notwithstanding actual exposure to great risks, *owing to plenty of fresh air*, the chances of infection were reduced to nothing.

Some time after death, as a matter of fact, plague corpses cease to be a source of danger, for the acids of the decaying body destroy the plague microbe, and other micro-organisms eat up its pabulum, and the corpse ceases to yield a suitable nidus for it.

The microbe resides *on*, but not *in*, the floor, for it is aërobic, and so the digging up of floors was, and is, like many other things done in the early days of plague here, a work of supererogation. The same remark applies to burning the excreta, which I spent much valuable time over at Parel, for we know the bacillus (contrary to Yersin and Hongkong experts generally, who seemed to be able to find it readily anywhere and everywhere) could *not* be found by Koch, and he is good enough authority, or any of the *savants* who came to Bombay with the German, Austrian or Russian Commissions. Its presence on the floor explains why women and children (mostly in the house day and night) are attacked first. The bread-winner goes out usually to his work in the fresh air, is not attacked, or suffers last of all in the family. Dr. Nariman forgets the value of the natural air purifiers—perflation, &c. Two thousand cubic feet, and perflation and free ventilation, do away with the necessity for periodical evacuation as advocated by Dr. Nariman. The expense also of such a visionary proceeding puts it out of practical accomplishment.

In typhus—the cousin german of plague—such a plan is not necessary. Why, therefore entertain such wild and mysterious notions about plague, which are disproved by actual experience? Again, I reiterate (and all are at one on this point who have written hospital reports) that “the ward of a sanitary plague hospital is one of the safest places during an epidemic.”

My confession of faith as to the factors inducing plague and favouring its propagation are, in the order of their importance:—

- 1st. Want of fresh air ;
- 2nd. Overcrowding ;
- 3rd. Filth, and this in a much less degree than any of the other two.

I call attention to this the more emphatically, because Dr. J. F. Payne, in our latest standard work on medicine (“Clifford Allbut’s System of Medicine,” vol. 1, p. 925) states:—“The first of these is uncleanness” as a social condition, favouring the continued existence of plague. “Overcrowding of dwelling-houses and absence of ventilation are also,” he states, “powerful contributory causes.” In my opinion, the truth is expressed by a reversal in order of these two statements.

At the close of the meeting, Dr. Blaney gave notice of his intention to submit the following proposal at the next monthly meeting of the Society :—

“That a Congress of the profession be convened in Bombay under the auspices of this Society in December next, to consider the most appropriate measures for dealing with plague epidemics in Indian cities, towns and villages.”

Owing to the lateness of the hour, it was proposed by Brigade-Surg.-Lieut.-Col. J. S. Wilkins, seconded by Surgeon-Capt. C. H. L. Meyer, and carried, that further discussion be postponed till next meeting. The meeting then dissolved.

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

AN Adjourned Meeting of the Bombay Medical and Physical Society was held in the University Hall on Friday, 15th April, 1898, at 5-15 P.M.

Dr. Edulji Nashirvanji was voted to the chair.

Present : Brigade-Surgeon-Lieut.-Col. F. C. Barker, Brigade-Surgeon-Lieut.-Col. T. S. Weir, Dr. T. Blaney, Dr. A. H. Deane, Dr. C. R. Marrett, Dr. D. MacDonald, Surgeon-Capt. B. B. Grayfoot, Surgeon-Major W. H. Quicke, Surgeon-Lieut.-Col. W. K. Hatch, Surgeon-Major M. A. T. Collie, Surgeon-Capt. C. H. L. Meyer, Surgeon-Capt. L. F. Childe, Surgeon-Major H. P. Dimmock, Surgeon-Col. G. W. R. Hay, Dr. N. N. Katrak, Dr. R. M. Kalapesi, Dr. F. Pearse, Dr. Ismail Jan Mahomed, Dr. G. B. Prabhaker, Dr. (Miss) Gertrude M. Bradley, Dr. (Miss) A. M. Benson, Dr. N. H. Choksey, Dr. D. R. Bardi, Dr. Sorab Nariman, Dr. D. A. D'Monte, Surgeon-Major Bannerman, Dr. W. M. Haffkine, Dr. Temulji Bhicaji Nariman, Dr. F. A. Foy, Brigade-Surg.-Lieut.-Col. J. S. Wilkins and Surgeon-Capt. H. Herbert (*Honorary Secretary*).

Business :—

Further discussion on Surgeon-Captain Meyer's and Surgeon-Captain Thomson's papers was resumed.

BRIGADE-SURG.-LIEUT.-COL. J. S. WILKINS said:—

MR. PRESIDENT, LADIES AND GENTLEMEN,—I have been asked by the Secretary to give you a short description of the work done by myself and staff at Cutch Mandvi last year during the serious epidemic there, and I propose doing so in as short an address as I can, dealing with some of the points which have been discussed by the members of this Society. The epidemic at Cutch Mandvi broke out some time about February 1897, and gradually increased in severity until it assumed

such proportions that help was asked for from General Gatacre, the result being that I and a few ward-orderlies, 4 Nurses and a Hospital Assistant, were sent there, arriving on the 27th April.

Before proceeding further, a short description of the city is necessary. Cutch Mandvi is a walled town about a mile square in area, one of the most important centres of trade with Bombay, Zanzibar and the various coast towns, containing 40,000 inhabitants in ordinary times, but about half this when we went; and it is stated that about 60,000 people were resident in this area when the epidemic started, owing to the numbers of people who fled from Bombay and Karachi when plague was raging. This area is filled with buildings of stone, dark ill-ventilated rooms being the rule in houses, lanes, not streets, very narrow and tortuous, sanitation practically *nil*. The latrines were these streets, and the scavengers, the cattle which roamed about everywhere. When we arrived there the plague had possession of the whole town and was raging with great severity. Dr. Lawson, who had arrived some days previous to our arrival, had already started two hospitals for the infected people, and when we arrived the search-parties were formed for various areas mapped out. Other hospitals (in all six) were formed for the various sects, and the work of disinfecting and cleaning up taken in hand by 200 coolies sent from Bombay. This was an ideal place for carrying on our work, as practically the only exits were gateways in the high walls, and all except two were kept closed, and when any death occurred they were bound to go through one or other of these, and the residence of these were traced and the house evacuated, disinfected, limewashed and opened out to the free air. In this way the whole town was cleaned out, houses, gullies, courtyards, &c., from top to bottom. The daily average mortality for the first week in May, when our work commenced, was 121, and a weekly decrease in the mortality of 20 took place till the normal death-rate of 5 was reached in the last week in June, or in between 8 and 9 weeks as you will see from the accompanying chart.

Measures adopted:—1. Removal of the sick from infected houses to hospitals by search-parties.

2. Thorough cleansing of those houses.

3. Removal of as many persons as possible to outside the city, where they made for themselves huts where they had plenty of fresh air and light.

4. The cleansing of gullies and the evacuation of all houses, street by street ; so that in course of time most of the inhabitants were camped outside.

5. One of the most important—the building of public latrines for the people.

6. Removal of certain trades, such as oil-mills, &c., to the outside of the city.

7. Building of huts for the poorer classes outside the city to relieve the congestion of the city.

The gates were again opened to all the people and the city allowed to be re-occupied about the end of June, and I am informed that very few, if any, cases of plague have occurred there for many months after we left, although the villages around were infected and had plague for months after. I believe that the disease has again broken out in the city a short time ago, but I have had no definite news as to its extent.

These, then, were the measures adopted in a city having the advantages of removal of sick and the removal of the people to the fresh air and the light outside the infected houses, and no doubt the result proved that it was the right method. Now I have had a great deal of experience, I may say in every season of the year, of the epidemic in Bombay, having had two very large districts under my care. How can we carry out the lessons learned in Cutch Mandvi here? We can isolate the sick in hospitals and we can cleanse the houses ; but the chief difficulty lies in the removal of the inhabitants of the infected houses to fresh air and light and the evacuating of all infected houses, and this is, as you may suppose, a very difficult task and difficult to carry out. But there is one thing we can do and ought to do at once, *viz.*, take in hand the sanitation of this city. I have, as I said, seen a great deal of this city, and the dreadfully insanitary state of a great portion of it is very evident to those who have worked in the slums of Bombay. Overcrowding, want of light, air, and proper latrine accommodation, has only to be seen to be believed. Latrines insufficient for the needs of the people, the doors opening into the houses so as to allow of the foul air poisoning the place. Gullies are badly constructed and allowing of leakage of sewage under them, so contaminating the soil and subsoil water and polluting the atmosphere and debilitating

the people so that they are unable to combat disease. What, then, is the remedy for these evils? I say, take in hand the sanitation of the city at once; close all the private latrines which are not constructed on the water-carriage system and are not sufficient for the accommodation of the people, and build public latrines on the water-carriage system. Widen your roads, and, so as to allow of more air-space, take down all the small and badly-built houses which take up air space between large houses, of which there are many examples in the city. License your houses to hold no more than a certain number of people, and so prevent overcrowding; open out rooms to more air and light. Then, gentlemen, I pin my faith on sanitation, and believe that if your city is in a good sanitary condition your citizens will be healthier and stronger and not give the plague or any other microbe a chance of wrecking the lives and trade of one of the fairest cities in the East.

SURGEON-MAJOR M. A. T. COLLIE read the following :—

CONTINUATION OF THE PLAGUE HISTORY OF HUBLI— THE FIRST THREE MONTHS OF 1898.

You will remember that Dr. Meyer brought the history of the plague up to the date on which he declared the railway camps to be “free,” and just before handing over charge to me had the disappointing task of declaring the town itself to be “infected” on the 9th January. He may have told you the story of Shidu, the man who infected the town—he who, through the disobedience and connivance of his friends in the police, succeeded in passing through the cordon round the “infected” chawls, stayed one night there, contracted the disease, and sickened in his own house in Mahrati Gully; then fled, tended by his wife, and after vainly seeking admission into the surrounding villages, was deserted by his cartman on the highway and died in the jungle on the 7th December.

Mahrati Gully, in which Shidu's house was, is not a crowded area, nor is it insanitary, except that the houses are constructed without proper means for ventilation and admission of light. This was aggravated, where space was available, by the construction of “lean-tos” round the original house. This system of accretion to the original house was due I am informed, chiefly to the prohibitive “building tax” now imposed by Government. It is estimated that the population of Hubli has increased about 10,000 in the past ten years (*i.e.*, since the railway was constructed), yet the area of the town has by no means com-

mensurately extended. These lean-tos have however, I understand, markedly increased. If on fuller enquiry it be found that this building tax is a distinct cause for the non-extension of the town, then it seems desirable to modify in some way such an insanitary measure.

To return to Mahrati Gully. 240 houses, occupied by 925 souls, cover an area of 5.35 acres. A street 900 feet long and 30 to 40 wide runs through this area, the houses being grouped on either side. On the east and west wide roads separate this locality from the more densely populated parts of the town. To the north lies an extensive open piece of ground. To the south a wide road, the remains of an old moat, and the old fort walls intervene between this area and the densely populated "Fort." It will be seen that Mahrati Gully is extremely well circumscribed and on the whole sanitary.

After Shidu's death on the 7th December nothing occurred until the 9th January, when 2 children living in a house on the other side of the roadway and 160 feet from Shidu's died from plague. They were undoubtedly indigenous cases, and on their occurrence Hubli was declared to be "infected." The greater part of Mahrati Gully was then cleared out. On the 30th January (21 days having elapsed without a case) I ventured to inform the Collector that I considered Hubli "free," but hardly had I done so when information reached me of a suspicious case in the "Health Camp." It transpired that this man (who had been 21 days in the "Health Camp") had heard on the 20th January that I had ordered the destruction of his hut, which was a lean-to against Shidu's house. He "squared" the police, left the camp, obtained access to his room on the 22nd January, and removed two articles of clothing^{*}; he died on the 30th January. The next case occurred on the 1st February in the first house beyond the "cleared

* An interesting fact was elicited by me during the first year of the epidemic, showing the danger of clothing of plague patients. A man lost his wife in Bombay, and ten days later he brought her clothing and ornaments to his house in a village near Hurnai in the Ratnagiri Collectorate. In about a week dead rats were found in this man's house and neighbourhood, then one relative after another sickened and died from plague, and ultimately the man himself became the sixth victim. None of his relatives had been out of their village. Eventually, this village and others suffered severely and many lives were lost. No plague cases had occurred up to the direct infection.

out " area and distant 165 feet from Shidu's. Then followed one on the 3rd and another on the 7th February in the extreme north-west corner of this area, and about 460 feet from Shidu's. Feeling that the plague had got a hold of this area, and in the hope that it had not crossed the well-defined boundaries, I decided on burning every house in Mahrati Gully.

The stake was a big one, for I hoped to save 60,000 people. However, to my great disappointment, 3 deaths occurred on the 4th March—2 in the Fort, 200 feet to the south of Shidu's house, and 1 across the Western Road, 480 feet away. The history of these cases was interesting: 4 Brahmins feasted together on the 1st March; they fell ill within a few hours, vomiting, diarrhoea and fever, and they died within a few hours of one another on the 4th. One fled from Hubli when he fell ill. The neighbours attributed death to poison, and even outside opinions on the specimens I had made failed to convince them to the contrary.

Then followed single cases on the 5th, 6th, 8th, and 22nd March, all at considerable distances from one another and from the originally infected area.

The interesting features of the outbreak in Hubli during the three months under report, are:

(1). That careful enquiry never revealed the slightest social intercourse between the victims—as a rule they were unacquainted with one another, or of different castes, as in the case of the Brahmins.

(2). The long period between each case in January and February.

(3). The distances between the houses of consecutive cases—the poison apparently passing over densely populated areas before it found a favourable nidus.

(4). The absence of dead and sick rats.

(5). That, with our present knowledge of the life history of the bacillus, it is impossible to declare any infected place "free," until the whole population returns to and resides for a lengthened period in the town.

As far as my experience goes there was not the slightest evidence that the disease was spread by direct human contact. The elaborate system for reporting sickness and death, and the long intervals between successive cases, practically exclude the idea of direct human infection. Moreover, instances of sick mothers—mothers ill with the most virulent form—broncho-pneumonic—suckling children, or of sick children being nursed by mothers with impunity, are not uncommon.

Measures taken.—Dr. Meyer has told you of the elaborate arrangements made in Hubli for having a daily roll-call of each household. He has also told you of the measures taken to have every death reported, and the precautions taken at the burial and burning grounds to prevent anybody being disposed of without a medical certificate. He has also told you of the large Health Camp constructed for the reception of the inhabitants removed from infected areas.

When an indigenous case occurred, the inmates of the house were removed to the Segregation Camp. Well defined natural boundaries were then sought for, and all the people in the infected area were sent at once to the Health Camp with such things as were actually necessary—all fabrics being passed through the steam steriliser, and boxes, &c., washed with perchloride of mercury solution. The houses were then locked and the inhabitants informed that as soon as their houses had the tiles removed and the interiors disinfected, they would be allowed to return in the day time to work at their looms, &c. This ensured the assistance of the people in many cases and the more energetic could be seen assisting in opening up their houses or in washing out cupboards, boxes, &c. After 15 days in the Health Camp, the people were permitted to live anywhere except on the area which had been cleared. No restriction was placed on their working in their houses in the day time. Not a single case of plague occurred amongst these people, and I think I would feel disposed on another occasion to make the experiment of allowing people to return to their houses for good after disinfection, provided they kept the roof open.

My experience of inoculation at Hubli was too limited to draw any inferences from, but I may mention that the few people who were allowed to return for good to their houses after inoculation did not contract plague.

Diagnosis of Plague—Like most medical officers I set out on plague duty thinking it was the easiest of all diseases to diagnose, but I am now

in a condition of absolute uncertainty when presented with a case demanding diagnosis. I do not think I am far wrong when I say that the majority of active medical practitioners in Bombay are more guarded in giving a diagnosis after two years' experience than they were at the beginning of the epidemic. Of course we know there are "cocksure" diagnosticians who are prepared to swear that a case is or is not plague. We have only to look at two instances to show us how difficult a disease it is to diagnose—(1) The mortality returns of Bombay; many of the deaths shown under other diseases must, I think, be admitted as plague cases. (2) The recent public announcement that the Khoja Hospital showed 80 per cent. recoveries was so astounding that one asked—What is the need for all this heavy expenditure and elaborate organisation, and what need for Haffkine's researches after a prophylactic, when a hospital claims a better percentage of recoveries for plague than has ever been obtained for cholera, enteric and many other diseases? If such a result be not due to the protective influence of Haffkine's prophylactic, then one naturally wishes to study such a successful method of treating plague, or study the cases and question the diagnosis! There is no need for giving details of the many incidents which have convinced me that nothing short of bacteriological culture is absolutely certain. Microscopic examination alone is not enough, nor is the examination of one gland sufficient. In the case of the Brahmins, all 3 corpses presented the same naked eye appearances of numerous hæmorrhages and the characteristic broncho-pneumonic exudation—in 2 the bacilli were present, whilst in the 3rd case there were none, though I had not the slightest doubt that all 3 were victims of plague. Again, in a boy with general glandular enlargement, from whose body I removed glands from neck, axillæ and groins, I only found bacilli in the small gland from the neck. I believe I am giving a low estimate when I say that 60 per cent. of plague cases cannot be diagnosed without *post-mortem* and bacteriological examination. This *post-mortem* examination was an extremely important factor in dealing with plague in Hubli. I made a *post-mortem* examination of every doubtful case of death. Hundreds of people were saved from disturbance by "plague measures" when I was able to declare a doubtful case not to be one of plague. I do not enter into the vexed question of "hurting the feelings of the people," but I may say that Brahmins, Lingayets, and Maharatis gave me no trouble; they saw the necessity for the examination of a corpse and peacefully acquiesced. That things ran

so smoothly I attribute entirely to the great influence of Dr. Cardoz over the people, and I have no hesitation in saying that were it not for his presence, plague measures would not have proved so acceptable. It is, in my opinion, extremely important that men who have become known and trusted by the people should be left amongst them when the introduction of plague measures is necessary. The personal equation is of immense importance for the success of plague measures, and the doctor who has won the confidence of the people is the greatest factor of all.

DR. WEIR, in thanking Dr. Wilkins for his interesting paper, and Dr. Collie for contributing another Chapter in the "History of the Plague in Hubli," remarked that he had a difficulty in forming any opinion as to the value of the measures adopted. For he had seen in localities where similar measures had not been adopted, and in localities where no measures whatever had been adopted, that results even more favourable had been obtained.

They had no doubt whatever that the measures adopted by Dr. Meyer had been most admirably carried out, and that they could not have been better carried out. On that point there would be unanimity of opinion, but when we examine the results of the measures shown in Dr. Meyer's figures, we find that in the Camp some eleven deaths occurred in a population a little over 1,000--that is, a mortality very much higher than that which occurred in the most crowded buildings in Bombay. In the City of Bombay in 1896 the total mortality including Plague was only 33,451 (40·71), and in 1897 it was not higher than 47,896 (58·28).

Take, for instance, another district, the Fort (Northern), which is just opposite to us. The total mortality in this district in 1896 did not rise above 33·06, and in 1897, notwithstanding the severe epidemic, it did not rise higher, and yet in this district the only precautions taken were those adopted all over the Island. To go a little outside Bombay, we find there are two Coorla village-towns close to each other and within a mile of one another. In New Coorla, nearest to Bombay, a severe epidemic occurred in 1896-97 and there has been no recurrence since, while in Old Coorla, in only one house in that village, in the house

nearest to New Coorla, only 5 cases occurred after dead rats had been found. Take the group of villages from Coorla right down to the sea opposite Panwell, not one case has occurred, though no measures whatever have been adopted to prevent the disease spreading to them. And if we go further to Wai, a place of pilgrimage to which large numbers of people went in 1896 and a portion of 1897 from Bombay, without hindrance, there has been only 1 case of plague, and an imported one.

The policy now followed by Government in dealing with plague is the policy that has been adopted thousands of years ago, and never with success, *viz.*, the isolation of the sick and the removal of the healthy from near the sick.

The ancients often dealt much more thoroughly with the sick than isolating them. It is entirely forgotten in the adoption of these measures that plague is a disease carried not only by human beings, but by rats, and all his experience suggests that the rats are the most important agency in conveying the disease, and that an epidemic cannot be sustained by infection from human being to human being.

If his belief is right, that the infection of the rat is necessary to an epidemic, then the measures now being adopted throughout India must fail ; and he would ask, Are we to discard the measure—inoculation—that science has placed in our hands, and only use the weapons that have been used for thousands of years ?

Here we have a weapon of undoubted efficacy, as we know from experience, which is totally neglected ; and yet measures have been used that are placing the population in opposition to Government—never known before—and creating scenes of the greatest humiliation for the officials.

Let us by all means use general sanitary measures. We have seen their value in Bombay in 1896.

Let us also use the prophylactic serum that Mr. Haffkine has prepared. There is a terrible responsibility in regard to the neglect of this measure.

BRIGADE-SURGEON-LIEUT.-COL. F. C. BARKER suggested that the feeling of the meeting should be taken with regard to inoculation.

DR. ISMAIL JAN MAHOMED said :

I shall thank Dr. Weir if he enlightens me on one or two points.

While advocating inoculation Dr. Weir calls the measure of segregating the sick and the healthy a right measure, but not a practicable one, in a large city like Bombay. I wish to know his opinion, whether it is possible, when the first one or two cases are detected, by carrying out segregation of the sick and healthy in a proper manner, to stamp out plague. I for my part believe that segregation properly carried out is useful, and when the plague is epidemic, inoculation and segregation should be combined. Dr. Weir has named two houses where after proper disinfection and renewing of the down-take pipes, very few cases of plague occurred. I know two other houses in Dongri Street, one belonging to Mr. Rhemtula Kharaj and the other opposite to it, where after adopting the same measures thoroughly, cases occurred next year. How can this be explained ?

BRIGADE-SURGEON-LIEUT.-COL. T. S. WEIR made a brief reply.

DR. BLANEY'S PROPOSAL FOR A CONGRESS.

Dr. THOMAS BLANEY then made the following motion, notice having been given at the previous meeting :—

“ That a Congress of the profession be held in Bombay in December next under the patronage of Government to consider the most appropriate means for dealing with Plague Epidemics in Indian cities, towns and villages.”

The following remarks having been circulated by Dr. Blaney, were taken as read:—

Few reasons, and but little argument, appear to me to be necessary to commend my proposal to the hearty and unanimous acceptance of this meeting. The proposal embraces four considerations which may be conveniently sub-divided into—

1. The assembly of a Congress of the Profession.
2. The time and place of the assembly.
3. The authority under which the Congress should be convened, and how its object should be promoted.
4. The ways and means by which the desired object can or should be carried out,

1. *The Assembly of a Congress of the Profession.*—The proposal involves the supposition that the plague epidemics that have occurred in this country in recent times have not all been dealt with in some recognised systematic and certain way, and that the time has come to formulate rules and lay down directions for future guidance, such as may meet with the approval not only of the profession in this country, but in all other countries. The supposition or suggestion contained in this part of the proposition, that a Congress of the Profession should be held, contains no reflection on the profession, for it naturally arises out of our own experience. There is no deficiency of sanitary knowledge as to the principles on which plague epidemics should be met: it is only when the details of repressive measures are unfolded and applied, that varieties and uncertainties in systems are discovered. The object of holding a Congress is to remove these varieties and uncertainties in procedure and to give unity, solidity, and certainty to all future anti-plague measures by the issue of authoritative and well-considered rules to be laid down by competent authority, being the Medical Profession. It is not incumbent on me to indicate what these rules should be or may be. That is the duty of a Congress, and to a Congress I will leave it. But I may be permitted to point out that up to the present all sorts and kinds and degrees of plagues are met and managed or mismanaged, without a classification of the various epidemics. Plagues may be usefully classified on the basis of the numbers and density of the population in infected towns and cities. On this basis we may recognise plagues of six classes. A first class plague epidemic would be an epidemic in a city of 500,000 persons and upwards; a second in a city of 200,000 to 500,000; a third in a city of 100,000 to 200,000; a fourth in a city of 50,000 to 100,000; a fifth in a town of 25,000 to 50,000; a sixth in a town of 10,000 to 25,000. All other plague epidemics occurring in smaller populations to be recognized as village plagues. If we had some such classification it would conduce to a better understanding of the various plague invasions we now read about. In the absence of an authoritative classification, the public and the press, and even Governments, are liable to regard all plague visitations as nearly equal, and capable of being suppressed or extinguished in the same time and by the same means. Moreover, the absence of a classification of plagues leads to the introduction of theories, and theories lead to the introduction of experiments, and between theory and experiments varieties of results are arrived at. If the proposed Congress should succeed in securing for any future

plague repressive measures a unity of professional opinion as to how the various classes of plagues should be managed, an undoubted benefit will be conferred by the profession on the people concerned. The full benefit of this united opinion can best be secured in Congress specially convened for the purpose. I need not enumerate the various major questions which will fall to be considered and decided by the Congress; more competent persons will formulate these questions and perpare them for the Congress. We know that no final opinion has been arrived at as to the value of the segregation of the sick in all stages and under all conditions of a plague epidemic, nor has any final opinion been arrived at as to how a sequœle of plague should be treated to ensure the prevention of a recrudesence of the disease, nor how a plague recrudesence may be made a final visitation never to return. Nothing definite is known as to whether a first plague visitation, supposing it to have been uncontrolled, has a definite age-period in this country. Nothing is known about the sequœle period which ends in a recrudesence; whether that also has a life period? And why the infective power of the plague poison should go into abeyance for a short season of a few weeks, suddenly to invest itself with a renewed activity! Why do plague epidemics naturally cease for a long series of years, in stricken countries which are supposed to be predisposed to the pestilence? These brief allusions to a want of definite knowledge about plague epidemics and their certain and appropriate management are sufficient to show the necessity for convening a Congress of the Profession to enable plague sanitation and plague suppression to take its place in sanitary literature alongside the other infective and contagious diseases which are better known and more successfully managed in European countries and in America and Australia.

In asking for a Congress of the Profession to elucidate the plague question, the object is not to imitate our brethren in Europe for the sake of imitation. We propose to follow the European lead because of its manifest advantages. Knowledge is said to be power, and collective and well-digested knowledge is concentrated power, as compared with the isolated knowledge existing in thousands of individuals, it may be who have not compared one another's knowledge. But why should I enlarge on the modern view of the advantages of holding congresses on professional subjects in the presence of this competent meeting! These advantages are doubtless better known to the gentlemen and ladies attending this meeting than I know them. Probably I have now said

enough on the first sub-division of my proposal to entitle me to proceed with the consideration of the second, *viz.*, *the time and place for the assembly of the Congress.*

2. The proposal selects Bombay as the place of assembly, and December as the month for holding the meeting. In selecting Bombay as the place for holding the Congress, the intention is to offer the greatest facilities to our professional brethren in this country to be present at the meeting. We are not exactly the "centre of the universe," as a leading Anglo-Indian journal of nearly forty years ago insisted that we were; we are more certainly the centre of the Indian Plague, but nevertheless Bombay can probably be reached as easily as any other large or presidential town in the country. Our sea and inland conveniences are sufficient and the speed of travel is fairly good. It goes without saying that because many of the cities and towns of this Presidency have unfortunately been visited with greater plagues and more plagues than any other part of India, this Presidency holds within the profession, if not a galaxy of talent for dealing with the pestilence, certainly the greatest experience of the disease, not only in this very large country, but, if I may venture to say so, in all the world. Claiming for the Bombay profession this wealth of experience—a claim which will be generally admitted—the possession of this qualification seems to me to settle the question of the place for holding the proposed Congress. I know it has been frequently urged that the only scientific atmosphere to be found in India is to be found in Simla, but if my proposal gives the preference to Bombay, it does so for the all-sufficient reason, that this Presidency is the chief centre of the pestilence and of vanquished and unvanquished plague.

The month of December has been selected as the most suitable time for holding the Congress, chiefly for the reason that it is not only possible but probable, that by December next the present plague invasion will then be dead and gone, not only in Bombay but in the Mofussil towns and villages of this Presidency. Whatever the future may have in store for this country, national misfortunes need not be speculated upon at present. As practical hygeists we will in December next find ourselves with an interval of rest from harassing and very onerous duties, and the proposal is to utilise that period of repose as a period of intellectual activity for the benefit of India and all the world beside. Another reason for selecting December is, that the best observers of plague in this country, and how to deal with it, will have had the op-

portunity of seeing what may be called a "complete plague invasion." By a complete plague invasion I mean a plague that has passed through its four ordinary periods of (1) a first invasion, (2) a sequœla or a period of partial subsidence, (3) a recrudescence, and (4) a final sequœla or complete subsidence. Up to the present time we have had many reports and papers on our recent plagues, but all imperfect and incomplete because none of them deal with a complete plague invasion. The proposed Congress will be able to consider a plague invasion from beginning to end, and will thus be well fitted to decide on the best measures of suppression or extinction. I put forward the proposal to hold the Congress in December, and to make Bombay the place of the assembly, as a tentative proposal, subject to such modifications as a Special Committee of this Society may decide.

3. *The authority under which the Congress should be convened and how its object should be promoted.*—I have already sufficiently urged the claim of Bombay as the most suitable place for holding the meeting; it remains only to add that the most suitable agency for convening the meeting and managing its proceedings seems to me to be this Society. I can find no organized professional association in India so well adapted as is this Society for taking up this leading position and carrying out this duty. We are not a very large society in respect of numbers, but I think we may claim to be a fully representative body of the profession in this country. Our rules may betray a slight official tinge, but this gives us the advantage of being presided over by a confrere of the rank and status of a General Officer, and I venture to think this is some little advantage. Of even greater importance is the question as to whether this Society possesses the confidence of the profession in India and the confidence of Government. I believe we have secured and do enjoy this confidence. Government is mentioned because of our dependence on the State in a matter of this kind. The Congress comes in as an aid to the State, and an educator alike of Government, of Municipalities, and of the people. The position of the Congress is therefore a beneficent position which cannot fail to attract the sympathy and the good-will of Government, and secure a favourable hearing for our petition. I will only add that the interests involved in the work of the Congress are world-wide in their scope.

I trust no member will propose the postponement of the meeting to another year or to a future time. Such a proposal would be fatal to

all progress. There is sufficient danger of delay in the tendency of the human mind to forget disasters as soon as immediate danger has ended and to be satisfied with good intentions in most of the affairs of life. If the accumulated experience of plague that is available this year is allowed to remain unutilised, it will be found well nigh impossible again to collect it in any large town in this country of incessant change,

4. *The ways and means by which the object in view can be secured.*—These are details of the main proposal that a Congress should be held. If that proposal receives the assent of this Society, the next proceeding will be to nominate an Executive Committee to prepare and set in motion the preliminary measures for giving effect to the wishes of the Society. I have only mentioned this subject in the present address with the view that some member will propose the nomination of such a Committee in order to economise time and complete the proceedings of this meeting on the present proposal at one sitting.

Dr. BLANEY then said :—

Since this paper was written it has been suggested to me that it would be preferable to request Government to take the direction and management of the Congress into their own hands, as it is a matter of general, if not Imperial, interest. Should Government recognise and establish the Congress, its success would be ensured beyond all doubt, for under that patronage the attendance would be more full and complete than it could be under any other.

Dr. N. N. KATRAK in seconding the proposition said that the idea of holding a Medical Congress for the special purpose of Plague was a very good one. He admitted that there was considerable force in what was urged by Surg.-Capt. Herbert (see below) in advocating that a General Medical Congress should be organised instead of one for the special purpose of Plague as proposed by Dr. Blaney, and that a special section for Plague be formed in connection therewith. In fact, the medical profession in Bombay were pledged to hold the second Indian Medical Congress in the City. Dr. Katrak, however, said that taking into consideration the uncertain state of public health of the City, he was afraid the General Congress would prove a failure, because he believed the attendance would be very meagre ; not only that, but the more important work of the discussion of the Plague question might also suffer

along with it. He was of opinion that, taking everything into consideration, the idea of holding a General Congress must be postponed to some future date and quieter times ; and the Society should confine all its energies solely to making the proposed Plague Congress a success. There could be no doubt that such a Congress was extremely desirable, nay, very necessary. A large amount of experience and information had been gathered by a number of medical men, but these remained scattered and disjointed. If all these experienced men met in a congress like the one proposed, it would be possible by mutual interchange of experience and opinions to frame certain rules of guidance in future epidemics. No one could say with certainty that the city had seen the last of plague, and that it will not spread all over India. Hence the profession was bound to make an effort to frame rules of guidance based on the experience gained during the last two epidemics. The Society therefore could not take this matter in hand too soon.

SURGEON-CAPT. HERBERT proposed an amendment :

“ If there is to be a Congress at all, it should be a general one.”

He read the following letter from Surgeon-Major Dimmock, who was unable to appear at the meeting early : “ I think Dr. Blaney’s proposition is not advisable, to have a Plague Congress alone. It was agreed in Calcutta that the next I. M. Congress should be held in Bombay this year, and I think it much better to have a General Congress and a Plague Section.” Surgeon-Capt. Herbert fully concurred with this opinion, provided it was thought necessary to hold a Congress at all. He brought forward the transactions of the Indian Medical Congress held in Calcutta in December 1894, showing that at the final meeting it had then been decided to hold the next Congress in this cold weather, 1898-99. The chief reason against the proposition of a special Plague Congress was the paucity of material and of men experienced in plague measures. Knowledge concerning plague as an epidemic was already concentrated in and about Bombay, and was confined to some half-dozen or more of men who had already given us their opinions and sent in reports to Government and read papers before this Society ; and nothing new was to be expected of them. And the bacteriologists who had worked at plague had also published their reports. Thus it was difficult to see what good could come if a large Congress were convened to discuss plague, consisting of men who knew nothing practically of the subject.

There was opportunity and material for a small meeting only, not a Congress. As to whether a General Congress should be held, it was a very large undertaking and must not be decided on lightly, and not unless men were prepared to work hard in the matter.

SURGEON-MAJOR M. A. T. COLLIE seconded the amendment, saying that he doubted the utility of a Congress, because every one who had had experience had already expressed their views, and the result of a Congress would only be the adoption of measures on which they were already agreed. That if we had more extended data on the effects of the prophylactic inoculation, and if one district in Bombay were "put in order" from a sanitary point of view, against the probable recrudescence of the disease next year, we would have more important grounds on which to lay down rules for preventing the ravages of the disease.

SURGEON-LIEUT.-COL. W. K. HATCH thought Dr. Blaney's proposal should be supported. There was a good deal of material that had not yet been utilised, and this Congress would be an inducement to men to work up the material. It would also be a means of instruction to men who had seen little or nothing of plague experience.

DR. BLANEY in concluding the debate said he was glad to find that his proposal had met with the approval of the meeting in its several features, the only objection being that the proposed Congress should be a General Congress. He thought the Plague Congress more urgent than a General Congress, and more manageable. He deprecated waiting for a further extension of plague in this country to increase our knowledge of the pestilence. He thought we knew quite enough about it at present, and only wanted to know how to deal with it when it came and how to be done with it for the future.

Surgeon-Capt. HERBERT's amendment on being put to the vote was lost. Dr. Blaney's proposition was carried. Fourteen members voted *for* and six *against*.

On the motion of Dr. N. N. Katrak, seconded by Dr. D'Monte, the following were nominated as a Committee to give effect to the resolution of the Society:—(The President, Surgeon-Major-General G. Bainbridge, has expressed his inability to serve on this Committee).

The Sanitary Commissioner, Brigade-Surgeon-Lieut.-Col. J. W. Clarkson, Brigade-Surgeon-Lieut.-Col. T. S. Weir, Dr. Thomas Blaney, Dr. Temulji Bhicaji Nariman, Dr. Ismail Jan Mahomed, and Surg.-Capt. H. Herbert (Secretary of the Society).

Surg.-Lieut.-Col. W. K. Hatch and Surgeon-Major Dimmock were also proposed as members of the Committee, but were unable to serve.

It was proposed by Surg.-Capt. H. Herbert, and seconded by Dr. D. MacDonald—"That, as the matter was an important one, the Committee should be elected by the vote of the whole Society, collected by circular. The members already nominated, however, were sufficient for the present purpose of addressing Government on the subject. Should the reply of Government be favourable, a circular should be sent to each member of the Society for the election of additional members of this Committee, who need not necessarily be all members of the Society."

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE usual Monthly Meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, 6th May 1898, at 5-15 P.M.

BRIGADE-SURGN.-LIEUT.-COL. F. C. BARKER in the chair.

Present : Surgeon-Lieut.-Col. W. K. Hatch, Surgn.-Capt. B. B. Grayfoot, Dr. T. Blaney, Surgn.-Capt. C. H. L. Meyer, Surgn.-Capt. Holt, Dr. R. M. Kalapesi, Dr. N. N. Katrak, Dr. T. B. Nariman, Dr. A. H. Deane, Dr. Ismail Jan Mahomed, Dr. C. R. Marrett, Surgn.-Capt. S. E. Prall, Dr. G. McPherson, Brigade-Surgn.-Lieut.-Col. J. S. Wilkins, Dr. D. R. Bardi, Dr. H. H. Knapps, Brigade-Surgn.-Lieut.-Col. T. S. Weir, Dr. P. Lisboa, and Surgn.-Capt. H. Herbert (*Honorary Secretary*).

Business :—

The following is the reply of SURGEON-CAPT. C. H. L. MEYER to Criticisms on his Paper of March 5th by Surgeon-Capt. J. B. Smith and Brigade-Surgn.-Lieut.-Col. T. S. Weir :—

Mr. President and Gentlemen,—In the discussion which followed my paper on Plague Operations at Hubli certain criticisms by Brigade-Surgn.-Lieut.-Col. T. S. Weir and Surgn.-Capt. J. B. Smith call for reply. To deal with those of the latter first.

I am told that I exaggerated when I put down the deaths from plague during the epidemic at Karad as one-fifth of the population. This statement was based on information gathered during a wait of some ten hours at Karad station in January last, and my informants, station officials and others, were several of them most positive that 3 or even 4,000 of the whole population of 12,000 had perished. Allowing for exaggeration I thought I might safely assume that one-fifth of the population had succumbed. I acknowledge that my assumption was made on somewhat unreliable data, but I had quite as much confidence in such information as in most municipal and gazetteer returns, which usually give too low a figure. Are the numbers Dr. Smith

gives themselves unimpeachable, based as they are on municipal returns? I myself, as just said, would be very chary in trusting municipal mortality statistics from most places in India. The municipal returns of Bombay city at present show a total plague mortality of about 27,000. This figure, it is generally acknowledged, greatly understates the facts, the true total being more like 40,000 or 50,000. Dr. Smith himself in his paper suggests doubts as to the correctness of the municipal returns of Karad; .g., when speaking of the low mortality in the month of June. Further, Dr. Smith assumes that the death-rate from "ordinary" diseases was the same as in "ordinary" times, whereas experience leads one to believe that in plague epidemics deaths from causes other than plague are fewer—possibly very much fewer. From these several considerations I think Dr. Smith must himself allow that his figures probably give too low a fraction. I admit in the light of further knowledge that my fraction is too high, but it might not be so if one took into consideration the reduction in population owing to the exodus during the epidemic. At Hubli no exodus was possible owing to the police cordon, and moreover the 35 deaths which occurred were all fully attested.

When I made enquiries at Karad, I did so purely from curiosity and desire of knowledge, and had no idea at the time of pointing a moral from what I had learnt. This came as an afterthought—an unfortunate one, for there proved to be a very critical and highly belligerent Medical Officer on the watch. I might easily have used instead the case of Damaun for comparison with the railway chawls at Hubli, and the figures would have furnished a good contrast, even although the death-rate at Damaun was considerably lowered by M. Haffkine's inoculations. I wish to be perfectly fair with Dr. Smith, and therefore beg to draw his attention to a point which has escaped even his critical eye and which hitherto had not occurred to me. The deaths in Karad were spread over some months; those in the Hubli railway chawls occurred in about six weeks. This difference in the time factor is of course important when instituting a comparison between the two cases. If read in one sense, it annuls all contrast between Karad and Hubli; if in another, it seems to indicate a much greater virulence at Hubli.

Dr. Smith further draws various comparisons between Hubli and Karad, all tending to belittle the difficulties of operations at the former place and to magnify those at the latter. The fact of the attacked

community being railway employes, far from lightening one's labours increased them enormously. The interests of a large railway company were seriously affected by many of the plague operations ; objections to measures were constantly being raised by the Company and its Medical Officer, and these had to be overcome by persistence and tact. The mere fact of having the railway people to *help* us doubled our work and anxieties, for we had less authority over them in case of any failure of duty, and felt bound therefore to constantly supervise their work, so that plague suppression should never be made secondary to the commercial interests of the Company. I should myself have very much preferred to have worked only with Government servants and officials. Considering how greatly their interests suffered, it must be acknowledged that on the whole the railway officials behaved uncommonly well. In certain individuals among them I had the greatest confidence. As regards the "police in plenty" Dr. Smith speaks of, it was found necessary to import over 40 men from Khandeish and elsewhere to supply our deficiencies. Again, our anxiety to keep plague out of the Dharwar District and plague-free Hubli could not have been greater than it was, with a sharp outbreak in one of the immediate suburbs of the city, the railway chawls, and advancing waves of epidemic at Belgaum and Sholapur, both connected by rail with Hubli. If Karad itself were deeply infected with plague, why all the anxiety and effort to keep it from entering from the surrounding infected villages ? I must protest against the attitude of carping criticism taken up by Dr. Smith. It was far from my intention (as he apparently assumes it to have been) to cast any reflections upon any of the officers attempting to carry out plague measures at Karad. I knew none of their names, nor was I even aware of their existence. I assumed from my information that evacuation had not been carried out at Karad, and this Dr. Smith does not seem to deny. I did not say, and do not now, that it was possible or impossible to carry it out during the rainy season. Dr. Smith protests so much as to make one suspect that the plague administration at Karad needs considerable defence. The old nursery maxim says that "where there's a will, there's a way." The will, the *dens ex machina*, arrived at Karad apparently at the end of August in the person of Surgeon-Major Baker, and found, like Sentimental Tommy, a way.

I have to thank Brigade-Surgeon-Lieutenant-Colonel Weir and others for their kind remarks about my paper. Dr. Weir's figures in Bombay are calculated on the total population, and therefore his mortality

rate is lowered by the inclusion in his estimate of races and castes, who either did not suffer from plague at all or were only slightly affected by it. Moreover again, by making his computation on the total population he still further dilutes his death-rate by including people living in well-ventilated and sanitary houses with no conditions of overcrowding. Such people can hardly be considered to be liable to plague at all. For perfectly fair comparison Dr. Weir, I maintain, should make his mortality calculations on that submerged three-fourths, or whatever the fraction may be, of the population of Bombay who live in similar conditions of overcrowding and insanitation as the inhabitants of the railway chawls at Hubli did. There is one matter I wish to explain, as there has been some confusion with regard to it. The epidemic in the population of the railway chawls, a suburb of Hubli, must be carefully distinguished from the plague in Hubli city itself. The outbreak in the latter is still, I believe, existent in the form of 1 to 2 cases a week—a rate which has never been exceeded, even although Hubli city was infected as long ago as December. The outbreak in the population of the railway chawls was truly stamped out—to use an expression which seems to have the same irritant effect on Dr. Weir and M. Haffkine as the colour red does on a certain domestic animal. The rest of Dr. Weir's remarks left this impression on me, *viz.*, that he had abandoned his faith in all measures except inoculation. In plague matters I do not think we should adopt this monotheistic attitude, which seems to be spreading and making many zealous converts. There are other gods we must believe in also and add to the list, *viz.*, evacuation of infected quarters, good sanitation, isolation of the sick, disinfection, the destruction of rats, quarantine, etc. I feel convinced that these measures have had considerable influence in curbing the spread and lessening the mortality of plague in Bombay and elsewhere. The good that lies in them all is rarely demonstrable by statistics, as in the case of inoculation, but nevertheless, as they are all based on sound principles of common sense and science, we should be cautious in abandoning them as useless.

The following were the remarks made by SURGEON-CAPT. J. B. SMITH, Assistant Civil Surgeon, Poona, on Surgeon-Capt. Thomson's Paper:—

At the March meeting of the Society, Surgn.-Capt. Thomson read a paper in which he made some references to Karad regarding which I

should like to make a few remarks. From early in September 1897 to the beginning of February 1898, I was practically responsible for all measures taken at Karad.

As Surgn.-Capt. Thomson refers to Mr. Brady (a Plague Inspector sent from Karad to Satara) I should like to state the circumstances under which he went. When plague seemed to be gaining head in Satara, I wired to the Collector (with whom I was in constant demi-official correspondence), asking if he would like me to send Mr. Brady and some trained coolies. On his replying in the affirmative, I despatched Mr. Brady at once with two gangs and sent five more gangs within a week, making 70 trained coolies in all and all fully equipped. This I did because I knew the difficulty there is in getting coolies locally at the outset of plague ; I also knew the difficulty connected with working with Bombay coolies, and the opposition they arouse among the people. Furthermore, most of the men were Mahrattas and natives of the district. I claim by my action in this matter to have made plague disinfection easier in Satara, and I think, considering this could only be done by the partial disorganization of our own work for the time, that Karad might have been spared the jibe. That, however, is a matter of detail, and I now proceed to the facts of the case.

Surgn.-Capt. Thomson speaks of Mr. Brady as being held up as the reliable disinfector of Karad. Mr. Brady was not the disinfector of Karad nor even the subordinate in charge of the disinfection. He was in charge of the Karad Search Parties and only disinfected occasionally. I myself personally supervised the disinfections in Karad town, spending a good portion of each day among the cooly gangs. I used to go from gang to gang teaching the coolies and shewing them with my own hands how to work the pumps and other appliances they had to use. In doing this I only followed the lead of Surgn.-Capt. Dyson at Bulsar, who also was his own *muccadum*, and I may here say I modelled our work at Karad largely on his very successful measures in that town.

Our motto at Karad was *thorough*, and our rule was that *everything* that could be moved went out of a house during disinfection, and *nothing* (with very few exceptions) was returned until it had been through perchloride solution. We paid special attention to the disinfection of furniture with perchloride solution, therein differing from Satara (*vide* rules attached to Surgn.-Capt. Thomson's report). I may here

mention that in one case there was reason to believe that plague had been transmitted by furniture from one house to another.

It was fearfully monotonous, tiresome work, but it was, I believe, the constant personal supervision that led to success. The coolies never knew which gang I would visit, and all knew that bad work meant fine or dismissal, not only of the cooly concerned, but of his *muccadum*. I trusted no subordinate, European or other. I endeavoured to visit every evening the houses done during the day. I believe the constant personal oversight of a Saheb, if possible a doctor, makes all the difference between successful and unsuccessful disinfecting. Perhaps, one might add that a belief in the efficacy of disinfection is probably contributory to its success. Mr. Brady is a good Inspector, but I have had occasion to reject houses disinfected by him, and to have them done over again. Therefore the disinfections done by him in Satara must not be taken as the measure of those done in Karad. None except those who are brought into close contact with coolies can have any idea of how soon the best trained become slack if not watched.

As to recurrence, my own experience is entirely at variance with that of Surgn.-Capt. Thomson. Since the middle of September last when the disinfecting operations were put on a proper basis, I can only remember having seen recurrence once in a house disinfected after that time. The circumstances under which it took place are interesting. Shortly after the general disinfection of the town was commenced, a death took place in a house I had myself seen disinfected. The house had been disinfected on the 27th September and the death took place on the 9th October, that is, 12 days after, and therefore outside the ordinarily accepted incubation period of plague. Investigation showed, however, that his wife had aborted at $8\frac{1}{2}$ months on or about the 5th October. None of the friends had thought it was plague. On examination she was found to have inguinal buboes. She had either been actually ill or was incubating at the time of the disinfection. There were many Brahmins and others in Karad at the time who were only too ready to pounce on failures and shew them up—this was especially the case with the “general disinfection,” which was greatly opposed at first. Surgn.-Capt. Thomson states—and states with an “N. B.” in front of it—that “cases have lately become indigenous, not merely imported into Karad.” One

would imagine that a statement made with such emphasis was at least accurate. What are the facts? I speak from information received from Lieut. Daunt, the officer now in charge of Karad. From 1st February to the 15th April there have been three plague attacks. Two of these, imported from Bombay, were stopped at the Observation Camp and thus never entered the town. One case (not cases) on March 6th was returned as "indigenous," because the source of infection could not be traced. The plague case, a Mussulman woman, was a daughter of a Police naik and married to a Police Constable, who was on duty at Kalembe, in the Satara District, when she died. Now Kalembe was at that time badly infected. The woman was stated to have been resident in Karad for ten months, and there was no means of proving or disproving this, for unfortunately by some mistake of the Committee appointed to apportion houses to the Plague inspecting officers, these Police lines were left out and so they were not regularly inspected. It is obvious that a Police naik could, without any difficulty, pass a relation into the town, and being a Mussulman, he would be likely to do so, for all Mussulmans objected to the Observation Camp. It is my own impression that the husband, finding plague getting bad at Kalembe, sent his wife to her father at Karad. The house in which this case took place had never been infected before at any time so far as is known, though a house five doors away had been infected in August (2 cases, 2 deaths).

That this case was indigenous is therefore open to reasonable doubt, but whether imported or not it hardly affects the argument, for, if indigenous, the disinfection which followed has prevented any spread from the 6th March to the 18th April. On this date (18th April) Lieut. Daunt tells me that no cases were found on searching the town the previous day.

Surgn.-Capt. Thomson also expresses his disbelief in Hospital Disinfection. In Karad Hospital *before* the adoption of systematic hospital disinfection 2 ward boys, 1 hospital assistant, and 1 compounder died of plague; *after* the adoption of disinfection, though the number of hospital servants was increased, there were no attacks among them.

Here I would enter a protest against Surgn.-Capt. Thomson's declaration of the inefficacy of disinfection—that is, until it is *proved* inefficient. He instances 3 cases where plague occurred after disinfection, 2 of these being within the incubation period laid down by

himself. So that, practically, his proof rests on one case ! Does the failure in a few cases of vaccination to protect from small-pox prove the general inutility of vaccination ? Before house disinfection is condemned let the course of an epidemic, where house disinfection is not resorted to at all, be compared with and found as satisfactory as the course of plague in Karachi, Poona, Bulsar and, I would add, Karad. Meantime such declarations as that of Surgn.-Capt. Thomson are only calculated to embarrass the work of officers whose duty it is to carry out disinfection, generally in the teeth of native opposition. So long as men have human weaknesses, so long will there be failures—and disinfection is no exception to the general rule. It seems to be the fashion nowadays to decry chemical disinfection for plague, because laboratory experiments show that a given chemical in a solution of given strength fails to kill the bacilli in a test tube. But laboratory experiments are not *always* conclusive, nor is the wisdom of the world gathered in a culture tube. The case is neatly summed up by Fothergill and Murrell:—"The bacteriologist, like the chemical expert, is generally right, but he is sometimes a little too dogmatic and is often apt to undervalue the importance of clinical observation." All of us can remember when bacteriologists shook their heads and said iodoform was no disinfectant—didn't even prevent the growth of *micrococcus py. aureus*. Yet what surgeon is there who does not pin his faith to iodoform as a preventor—probably the best preventor—of septic processes in wounds ? So, I believe, it is with corrosive sublimate house disinfection—the plague bacillus may or may not be killed, but its power of doing harm seems to be effectually stopped. How this results I know not, nor from a practical point of view does it matter. One is often met with the argument that perchloride of mercury solution is precipitated by albumen, and so is useless. Even supposing it is so precipitated, I imagine albuminate of mercury is not a healthy soil for plague bacilli to live on, and so, if not actually killed by the solution of mercury, is it not possible they may be starved out ?

In Karad it was found that the house disinfections abolished bugs, for the time at least. Now if leeches are capable of spreading plague, why not (despite certain researches on the subject) bugs ? I think the possibility must be admitted. If this is so, it would *help* to explain the action of house disinfection.

As an alternative to, or rather instead of, chemical disinfection, Surgn.-Capt. Thomson proposes to deal with the disease "by the

provisions of adequate inlets for vivifying sunshine and fresh air—nature's great reliable disinfectants." On turning to his own rules in the appendix we find it laid down "if there be not sufficient light in the room so as to recognise the features of another person (the door being shut) holes are to be made, each 6 ins. by 10 ins., and *not more than four in a room.*" Does Surgn.-Capt. Thomson think that $1\frac{1}{2}$ sq. feet is sufficient ventilating aperture to disinfect even the smallest native room?

Surgn.-Capt. Thomson has got a theory that plague is a want-of-fresh-air disease, and that those who assert it is a filth disease are in error. But his arguments do not seem to me to be sufficient to support his theory. In the epidemics of bygone days Europeans in India enjoyed no such immunity, I believe, as they seem to now. Why? The climate necessitated then, as now, the best ventilation for Europeans as a condition for ordinary comfort. Whilst, on the other hand, there is reason to believe that the Europeans of to-day are a cleaner race than those of a hundred years ago, both as regards private and public hygiene. Surgn.-Capt. Thomson instances "prisoners who would be filthy if they could, but are exempt." But as they are not allowed to be filthy, the argument from them falls to the ground. Again he asks for an explanation why Wai, the dirtiest town in the presidency, should remain exempt. To answer this, one has only to quote one of his own Socratic dialogues, "You have plenty of gunpowder, but no fire has been brought in contact with it." To prove his own theory Surgn.-Capt. Thomson should have shown that Wai, though dirty, was an exceptionally well ventilated town. Besides, it is still too early to say that Wai will retain its immunity. The incidence of plague in Bombay Jails (where it may confidently be assumed that the jail regulations are carried out as carefully as at Satara) has got to be explained by more than an *assumption* of overcrowding or unsuitable locality. I may state that prisoners from Karad were quarantined and disinfected before going to Satara at all. Surgn.-Capt. Thomson further states that one "epidemiological fact is that the houseless, wandering beggars, known as Byragees, have not furnished a single plague case either in the return of the Satara city or district." By district I assume he means the villages immediately surrounding Satara and not the Collectorate. Speaking from memory, I believe I have seen such in the Karad Plague

Hospital. But in any case it is a comparatively small class which is not likely to frequent plague centres, and who if sick would more easily than any other elude the vigilance of the search parties.

I do not say the want of fresh air theory is wrong. I only say the evidence brought forward does not prove it, and I for one deprecate with Surgn.-Capt. Thomson "hasty and unwarranted conclusions regarding the etiology of the disease." Though Surgn.-Capt. Thomson is a disbeliever in perchloride of mercury as an *external* disinfectant, he seems to be thoroughly convinced of its efficacy as an *internal* disinfectant—though here, as in house disinfection, we are confronted with the albuminate of mercury. But as the most characteristic effect of mercury, *viz.*, salivation, is wanting, it is allowable to question if the mercury is absorbed at all, or in any quantity, from the intestinal canal. It is well known that in many diseases (*e.g.*, tetanus) the assimilative power is greatly diminished. May not this be the case with plague? Has Surgn.-Capt. Thomson tried the remedy in equivalent doses by hypodermic injection without causing salivation?

What is really wanted is a thorough investigation by a bacteriological expert of the life history of the bacillus of plague and of the mode of infection. We seem to be in entire ignorance of where the plague bacillus really lodges in a house, and consequently every wall, the floor, the roof, &c., have to be washed down with perchloride solution. It would save an immense amount of trouble, money, and valuable time if, for instance, it were certainly known that the bacillus existed only on the floor of an infected house.

Another point in connection with plague seems to me to need clearing up. Lowson stated that during the latter part of the epidemic in Hongkong about 85 per cent. of the cases were diagnosed by the microscope alone (*Indian Medical Gazette*, Feb. 1897). This was an examination of blood drawn from the finger tip. Now it is asserted that the bacilli are never found in the blood except just before death. Which of these statements is correct? And how is the discrepancy explained? If Lowson was wrong, confidence in bacteriological diagnoses by general practitioners will be weakened. I would venture to suggest for further observation by those who have the opportunity, the question, Are the earliest indigenous cases of

plague in an epidemic usually non-bubonic? If so, is this the explanation of the so-called latent period between the imported and the indigenous cases?

In Karad over a month before the plague was officially announced, the Mamlatdar and Hospital Assistant made an examination of certain cases reported to the Collector as plague. The Hospital Assistant—an experienced and sharp man—stated (12th June) that they were suffering from “ague, except one or two suffering from bronchitis and consumption.” Yet one of the cases (not seen by the Hospital Assistant) mentioned in the Mamlatdar’s report is very significant. The mother of a man named Ambaji Tambat, aged 60, died on 4th June of “fever.” Ambaji died himself on the 6th June of “ordinary fever,” and Ambaji’s wife died on the 8th June. She had not been ill previous to her husband’s death, but caught, as the Mamlatdar puts it, “a fever of an extraordinary type.” All these cases were said to have had no buboes. The Mamlatdar and Hospital Assistant have been blamed for concealment, and among those who blamed I was one. But since I wrote my official report it has occurred to me that the early plague cases at Karad *may* have been non-bubonic, and that perhaps this is generally so. For this belief I would venture to advance the following reasons. At the time Surgn.-Lieut. Robertson and I went to Karad the epidemic in the villages was in a much earlier stage than that in Karad Town. I remember that at that time Surgn.-Lieut. Robertson remarked on the large number of non-bubonic cases he saw in the villages as compared with those in Karad. They showed all the general symptoms of plague but were without buboes so far as could be discovered by external palpation. Among the worst cases admitted into the Karad Plague Hospital were some of these non-bubonic cases from the villages near.

Quite recently a village named Kesa, near Karad, became infected and I understand from Lieut. Daunt that almost all were non-bubonic. Assistant Surgeon Bharucha noticed the same thing in the villages which were under his care, and he has noted cases which either simulated, or were combined with small-pox, leading to an epidemic of the ordinary bubonic type. In Satara, I understand from Dr. Beach, the earlier cases were largely non-bubonic.

Again in Bombay the death-rate began to rise early in August 1896—that is, two months before the plague was announced. As the bubo is often painful, and as in August and September 1896 there was no Epidemic Diseases Act, and consequently no fear of plague measures, the patients would probably not conceal buboes if they had them. It is hardly likely that shrewd native practitioners would treat a very fatal form of fever *with buboes* without trying to find out what it was. While on the other hand if unattended with buboes they might very reasonably believe it to be malignant malarial fever. The course of an epidemic, if this surmise be correct, would possibly be (a) imported cases giving rise to (b) indigenous non-bubonic cases which gradually merge into (c) ordinary bubonic cases.

It is impossible to support a theory on one or two facts, but I would suggest this question for future observation and confirmation or rejection. If true, it would be a most important fact; for the early cases in a town are what we want most of all to get hold of, and yet if non-bubonic they are very likely to be overlooked by those who have no practical experience of plague. It is unfortunate that the adjective “bubonic” ever got affixed to “plague,” for it is liable to lead to errors in diagnosis.

I have made my confession of faith as a believer in chemical disinfection properly carried out, but I think at the same time that every other means that holds out a fair prospect of mitigating or preventing the spread of plague should also be enlisted. Circumstances were against making much use of Professor Haffkine’s inoculation at Karad in the height of the epidemic, but when this was somewhat abated, I made every effort I could to get people inoculated both privately and by public meeting, and by giving inoculated persons certain facilities with regard to passes. I even set up a booth in the bi-weekly fair. My efforts were not very successful. As danger was past people did not see the object of being ill for a week or ten days. Were I again placed in charge of a plague-stricken town, I should afford every inducement for inoculation. Inoculation when perfected will probably in the future afford, with unroofing of infected houses, the quickest and cheapest way of dealing with plague in villages and small towns. In the larger towns possibly inoculation and chemical disinfection will go hand in hand.

I attach a statement showing the course of the epidemic from the official announcement of its existence to end of January 1898.

Epidemic of Plague, Karad 1897-98.

| WEEK ENDING | Karad Municipal Area including Plague Hospital, Observation and Segregation Camps. | | | | Karad Town Proper. | | | | Excess of entries into Karad over exits showing trend of population. |
|---------------------------|--|---------|----------------|---------|--------------------|---------|----------------|---------|---|
| | Total. | | Daily average. | | Total. | | Daily average. | | |
| | Attacks. | Deaths. | Attacks. | Deaths. | Attacks. | Deaths. | Attacks. | Deaths. | |
| July 10, part of week. | 13 | 1 | 4.3 | .3 | 13 | 1 | 4.3 | .3 | |
| 17 | 24 | 18 | 3.4 | 2.6 | 20 | 10 | 2.8 | 1.4 | |
| 24 | 55 | 27 | 7.8 | 3.8 | 38 | 11 | 5.4 | 1.6 | |
| 31 | 69 | 43 | 9.8 | 6.1 | 60 | 12 | 8.5 | 1.7 | |
| Aug. 7 | 86 | 76 | 12.3 | 10.8 | 69 | 15 | 9.8 | 2.1 | |
| 15 | 156 | 117 | 22.3 | 16.7 | 137 | 51 | 19.5 | 7.3 | |
| 21 | 207 | 156 | 29.5 | 22.3 | 198 | 103 | 28.3 | 14.7 | |
| * 28 | 249 | 204 | 35.5 | 29.1 | 216 | 128 | 30.8 | 18.3 | —2 |
| Sept. 4 | 204 | 161 | 29 | 2.3 | 182 | 102 | 26.0 | 14.5 | —11 |
| 11 | 123 | 97 | 18 | 13.8 | 116 | 63 | 16.5 | 9 | —4 |
| 18 | 103 | 80 | 14.7 | 11.4 | 88 | 54 | 12.5 | 7.7 | —12 |
| 25 | 46 | 37 | 6.5 | 5.3 | 38 | 13 | 5.4 | 1.8 | —2 |
| Oct. 2 | 34 | 27 | 4.8 | 3.8 | 28 | 12 | 4.0 | 1.7 | 12 |
| 9 | 21 | 11 | 3.0 | 1.5 | 17 | 7 | 2.4 | 1 | 103 |
| 16 | 19 | 16 | 2.7 | 2.3 | 14 | 9 | 2 | 1.3 | 289 |
| 23 | 12 | 7 | 1.7 | 1.0 | 6 | 4 | 0.8 | 0.5 | 262 |
| 30 | 9 | 9 | 1.3 | 1.3 | 7 | 7 | 1 | 1 | 183 |
| Nov. 6 | 8 | 6 | 1.1 | 0.8 | 4a | 3 | 0.5 | 0.4 | 146 |
| 13 | 1 | 1 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 219 |
| 20 | 5 | 3 | 0.7 | 0.4 | 3b | 2 | 0.4 | 0.3 | 170 |
| 27 | 4 | 6 | 0.5 | 0.8 | 1 | 0 | | | 237 |
| Dec. 4 | 0 | 0 | 0 | | 0 | 0 | | | 280 |
| 11 | 4 | 3 | | | 1c | 1 | | | 190 |
| 18 | 1 | 1 | | | 1c | 1 | | | 177 |
| 25 | 1 | 1 | | | 0 | 0 | | | 151 |
| Jan. 1 | 2 | 2 | | | 1d | 1 | | | 176 |
| 8 | 1 | 1 | | | 1c | 1 | | | 93 |
| 15 | 1 | 1 | | | 0 | 0 | | | 58 |
| 22 | 0 | 0 | | | 0 | 0 | | | 148 |
| 29 | 1 | 0 | | | 0 | 0 | | | 120 |

* Surgn.-Major Baker's visit and the placing of disinfection on better basis.

a 3 imported.

b Of 3 cases 2 certainly, 1 probably imported.

c Imported.

d Doubtful of plague.

REPORT BY ASSISTANT SURGEON E. S. BHARUCHA.

Outbreak of Acute Septicæmic Plague preceded by Small-pox.

The first variety prevailed in the beginning of an epidemic in several villages, the symptoms being very acute, their onset sudden and accompanied by a rigor and high fever, deeply injected eyes, complete nervous and cardiac prostration developing within a short time (vary-

ing from a few hours to about two days), absence of buboes and almost invariably fatal ending. The first cases of plague in several villages where I had the opportunity of seeing them were of this type, and it is therefore no wonder that in the absence of a bubo the village officers in several instances did not understand the true nature of the disease until either the increased death-rate caused inquiries to be made, or the septicæmic variety of plague was followed by the true bubonic type. The villagers often unsuspectingly, but at times to avoid the troubles of the imposition of Plague rules, gave out all such cases as cases of ague. I therefore advised the Taluka Mamlatdars to issue instructions to all the village officers to obtain from all villages a weekly return of deaths and their causes. The Taluka Mamlatdar of Khatav very judiciously went a step further and issued orders to village officers to report without delay whenever there occurred in one week more than two deaths from "ague" in their respective villages, especially if two deaths occurred in one and the same family closely following one another, no matter from whatever cause. Thus it was that I had the opportunity of observing some of the very early cases at Chitali and Nandoshi, and the history of the commencement of plague at the former place is very interesting indeed. In that village plague was preceded by a short yet severe epidemic of small-pox. Fourteen cases and ten deaths had occurred in from four to five families before plague broke out. Reports having been received of an abnormal death-rate at Chitali, the Plague Mamlatdar of Khatav and Khanapur Talukas at once visited the village, but was satisfied that the increased mortality was due to small-pox. The vaccinator of the District also saw those cases and actually proposed vaccination as a preventive measure, which, however, the people refused to undergo. About a week after an old and a young man belonging to one of those families in which three cases and two deaths from small-pox had occurred, were attacked with fever, but as they did not develop any characteristic marks of small-pox and soon became seriously ill, the village officers requested me to visit the place and give an opinion. Accordingly I went there the next morning and saw both these men, as well as the recovered case of small-pox in their family and two other cases of small-pox in the village which were also recovering. I had no difficulty in diagnosing these two latter, but could not come to any conclusion as to the two former. They were both seriously ill but had no buboes. I deferred giving an opinion in the absence of any diagnostic signs and kept them under observation, isolated from the

rest. The old man died before my next visit, and I was told did not develop any bubo, but the younger one was still living, though in a critical state. In his case also there was no bubo anywhere. During this interval two more cases occurred in other families where previously small-pox had occurred. They too were very seriously ill, but had neither buboes nor the characteristic symptom of small-pox. I confess I was exceedingly puzzled as to the proper diagnosis of these cases. Had there been no previous history of small-pox in the families affected, I would have had no difficulty in at once pronouncing them as plague cases of the septicæmic type, but there was just a little doubt in my mind, owing to the previous history of small-pox and the absence of any diagnostic signs of plague, that the cases seen by me might be examples of that rare variety of small-pox known as *Variola Sine Eruptione*, about which I had read, but which I had never come across in actual practice. All doubt, however, soon disappeared, as on my next visit a well marked bubo appeared in one case in one of the groins, and from that time onwards for about a fortnight plague of a very severe type prevailed in that village, and then ceased as abruptly and quickly as it had begun.

In another village, *viz.*, Kalembe, there was also observed one fatal case of small-pox in a Brahmin family in whose house one fatal case of plague had occurred about three or four days previous. This plague case was not seen by me personally, but the girl with small-pox—who, by the way, was the wife of the former—was seen by me before her death. Here, however, the case of small-pox was a sporadic one and apparently followed plague, whereas at Chitli there was a regular epidemic of that disease, which, so to say, lapsed into plague. I believe nowhere else has this apparent transition of an epidemic of small-pox into one of plague been observed, and this is to my knowledge the first instance of its kind. Cholera has been described by some to have preceded an epidemic of plague, but it is a significant fact that I have never come across instances of that kind in any village affected after my arrival here. I have already alluded to the supposed prevalence of cholera at Kaledhon before plague broke out at that place; and at Vezegaon (a village affected before my coming and which suffered severely from plague) cholera is said to have prevailed before the breaking out of plague: I, however, do not place much reliance on these reports. Under the circumstances, the fact of an apparent connection of small-pox with plague is very interesting and suggestive.

In this connection I may state that in the village of Mahuli, plague is said to have followed upon what I understand to be a mild epidemic of mumps, "Galgurda." I happened to see one or two instances of this, but I preferred to take these cases as examples of mild form of plague with parotid buboes. I may be allowed here to make a passing reference to a similar experience I had when I was in charge of the observation wards of the Sassoon Hospital during the first epidemic of plague in Poona. The first typical case of plague amongst the famine-stricken girls housed in Shâradâsadan at Poona was preceded by a rather severe outbreak of what seemed to be mumps amongst them.

After the above report was written as to the apparent connection of small-pox with plague, an epidemic of the latter being preceded by that of the former, I have come across another instance at Yelgaon in the Karad Taluka. Here also a severe epidemic of plague was preceded by a mild prevalence of small-pox and the first cases of plague were of the septicæmic variety, having no buboes. There is, however, one point of difference between the plague epidemic at Chitli following on small-pox and that at Yelgaon. In Chitli *the first cases of plague occurred in the same house where previously small-pox had occurred*, whereas in Yelgaon the first cases of plague occurred *in different families where previously small-pox was not observed*.

NOTES OF THREE SURGICAL CASES.

BY SURG.-LIEUT.-COL. W. K. HATCH, M.B., F.R.C.S.

Blood Cyst of Sciatic Nerve.

The patient, a Goanese, was admitted into hospital on 11th December 1897. He was a healthy looking man of about 40 years, a cook by occupation, his family and previous history were not important. He complained of a tumour at the back of the left thigh. The tumour came on about ten years ago; there was no injury to the part; it was quite small when first noticed, and gave him no pain or inconvenience of any kind; he therefore took no trouble about it. About a

month before admission, the tumour, which had gone on increasing slowly, became slightly painful. He applied several remedies, "mints" leaves and iodine and poultice, but was in no way relieved. On admission he was in fairly good condition, skin somewhat scaly in places; he complained of pain in the left thigh, increased on movement. On examination a tumour, the size of an orange, was found at the back of the thigh at the junction of the middle and lower third. The skin over it was healthy, slightly shining and free from this growth. The swelling was globular, firm, smooth and slightly elastic, very moveable from side to side, but not moveable up and down; if the leg was flexed the tumour could be moved more readily. Movements of the lower extremity were the same as those of the right side; the limb was not wasted; pain was felt in the tumour and down the leg while walking; this made the patient limp a little. No tingling sensation was complained of. The femoral glands were not enlarged. The flexor muscles were evidently superficial to the tumour but spread over it in a thin layer. All the organs were healthy. On the 14th December the patient was prepared and chloroformed, a longitudinal incision 5 inches long was made over the tumour, the flexor muscles were then reached and dissected off the surface over which they were spread in a thin layer; on retracting them the tumour was fully exposed. The surface was slightly lobulated and had a bluish appearance; towards the lower end a yellow spot was seen, and here there was slight bulging. Continuing the dissection up and down the swelling was found to be connected with the sciatic nerve; a few veins and nerve fibrils ramified over the surface. A small puncture accidentally made on the surface allowed pure blood to escape with considerable force; the opening was closed with forceps, and the nerve fibrils which were in contact with the surface were very carefully separated on both sides. The sac was then completely evacuated, and the trunk of the nerve which was spread out on its deep and anterior surface was defined and the sac removed; a skein of fibres having been cut near the upper end of the cyst were then sutured. The wound was then injected and closed. Examination of this sac showed a thin wall apparently continuous with the sheath in front, slightly yellow in parts and containing pure blood and a little fibrin and hæmatoidin crystals. No hooklets were found. The patient made an uneventful recovery, the temperature rising twice to 100°; there was sound healing and entire use of the limbs; no difference in sensation or motion could be detected. He was therefore discharged on January 9th.

DR. MEYER asked what was the origin of the cyst ; whether it had been due to rupture of a blood vessel.

DR. HATCH said that possibly it was so, as an artery had required ligature.

Intussusception—Chronic.

The patient, a woman of about 20 years, was admitted on March 4th with abdominal pain, into my wards, having been transferred from the gynæcological wards. Her family history was satisfactory, but very little information could be obtained from the patient herself. She either answered in a confused manner or contradicted herself entirely. Her husband's account was altogether different. She stated that she was confined 8 months ago and that 2 months after she felt pain and swelling in the abdomen. Her husband said that she was perfectly well until 13 days ago. Plague having occurred in their chawl, they were taken to a camp. She then complained of pain after 8 days, went to the Petit Hospital, where she remained 5 days. By occupation she is at times a beggar. On examination she was much emaciated and anxious looking, the abdomen showed 'lineæ' well marked, the heart and lungs were normal, pulse 120 per minute. The tongue had a thin white fur on the dorsum. Every day she vomited after food, vomit consisting of food and bile, no blood ; the stools were thin and watery containing very little fæcal matter ; a few black specks were present. The abdomen appeared tumid, there was a painful tumour extending across the upper part from the ribs on the left side to the costal margin and a little beneath on the right side ; the tumour had a rounded sausage-like feel ; it was said to have been noticed much lower down towards the left iliac region, but I never found it in any other part than that noted ; it gave a dull note on percussion, and had a solid feel ; a small tympanitic area could be made out between it and the ribs. The length appeared to be about 6 inches and breadth $2\frac{1}{2}$ inches ; surface smooth and not fluctuating nor elastic at any part. Pain was increased by pressure, the patient appeared to suffer from pains always more or less, but no movements of the bowel were visible under the walls. No connection could be made out with either liver or spleen. On pressure over the abdomen gurgling was perceptible. The urine was normal. Owing to more or less constant pain, bad and insufficient food, the woman was in a very weak and irritable state, and it was only with

difficulty that an examination could be carried out. Taking everything into consideration I concluded the tumor was intestinal. On the 8th March she was chloroformed and a median incision 4 inches long from 2 inches below the ensiform cartilage was made. On opening the peritoneum the omentum was disclosed, and on examining this up to the tumour the latter was found to be the transverse colon and of a dark purplish colour ; the cylinder had a semi-solid feel. An incision 2 inches long was made along the upper margin, fœcal matter and yellow sloughy matter, having a very foul odour, made its appearance. This was removed and the bowels examined. It was then seen that the upper part was intussuscepted to the extent of 4 inches, the intussusception had a solid feel, and at its extremity a yellow sloughy surface and other gangrenous patches on the surface near the base. It was evidently out of the question to attempt reduction. I accordingly ligature the base and amputated the mass ; one vessel, a vein, required ligature. The galvanic cautery was applied to the cut surface, which was dusted with iodoform, the calibre of the bowel was then found to be unobstructed. During the operation the patient's pulse was very low, and she vomitted greenish stuff several times. The opening in the bowel was closed by Lembert's sutures, and the abdomen by silver wire. The patient remained in a collapsed condition and died at 5 o'clock the same evening. The specimen I now show you. It is singular how few cases of intussusception are admitted into the hospital.

Some returns from the J. J. and Petit Hospitals were shown to illustrate this fact.

Tubercular Kidney.

The patient, a much emaciated man, was admitted on the 14th February into the medical ward, complaining of hiccough and milky urine. After a day or two he was transferred for surgical treatment. About 12 years ago he had had a venereal sore not followed by any eruption ; he also had fever on various occasions. He had also suffered from gonorrhœa 8 years back, and had lately several times noticed that the urine was turbid and noticed also at times a gleety discharge ; a year ago he had an attack of fever at Madras which lasted 4 months with rigor and profuse perspiration ; in consequence of this he became very weak. Three months before admission he came to Bombay. One night he was seized with severe rigor, this was followed by fever for a week, and then he began to notice pain in the left lumbar region ; he resumed

work, but the pain became more and more severe, and the urine was turbid and threw down a deposit ; finally he was attacked by severe hiccough and so came to hospital. His father died of cough.

On admission he was very anæmic and weak, muscles flabby, expression anxious, the pulse appeared full but easily compressible, appetite was poor, retching and vomiting at times after food. The abdomen was slightly distended, liver not enlarged ; in the left hypochondrium a swelling could be felt extending from the spine to tip of tenth rib in front and downwards an inch from the illiac crest ; it was smooth and firm to the feel, lower border a little irregular ; tender on pressure and always painful, especially during movements ; it was dull on percussion, fluctuation could not be made out. No movement could be detected in any direction. Dulness extended upwards beneath the ribs to the splenic area. The lungs were healthy. Urine was milky white, Sp. G. 1006, with a trace of albumen, abundant deposit of triple phosphates and pus, no blood. Micturition was rather frequent—ten or twelve times in 24 hours. No pain or swelling in the right lumbar region. Diagnosis was made of tubercular nephritis.

He was chloroformed on the 19th, having been previously prepared for operation ; the usual oblique incision was made behind on the left side, and the soft parts divided until a sac-like covering was reached ; this was opened, and a quantity of pus evacuated. On introducing the finger it was found that there was an opening into the kidney through the capsule, the substance of this organ being broken down, while the capsule itself was studded with caseating tubercle. The incision was now enlarged by a cut at right angles to the first and about 3 inches long, the kidney was separated with difficulty from the thickened peritoneum in front, the ureter was then ligatured low down and the renal vessels next ; the kidney having been removed, it was found that the ureter had an unhealthy appearance ; it was therefore dissected carefully and another inch removed ; the wound was partially closed, the lower end being left open after plugging with gauze.

Examination of the kidney showed a thick capsule, numerous small abscesses between the kidney and capsule, and yellow caseous points scattered about the substance of the kidney. In one of the calyces was a smooth phosphatic stone nearly an inch long tapered at both ends. The secreting structure had a gelatinous pulpy appearance. The patient

was free from pain, but died next day. A short *post-mortem* was made. The lungs were healthy, the heart fatty. The descending colon where in contact with the thickened peritoneum was much diminished in calibre, and the meso colon rigid with tubercular matter. The large omentum was adherent to the peritoneum in Douglas' pouch and between the bladder and rectum was a large abscess full of pus, which seemed to have travelled down along the ureter. The right kidney when in situ appeared normal, but on removal it was found to be riddled with very small abscesses, containing green pus; this seemed to have originated in the cortex and travelled to the capsule: small caseous deposits were also present in the substance of the organ. The ureter was thickened; the remains of the left one appeared healthy.

During life the condition of the right kidney was not diagnosed—in fact, there were no symptoms pointing to it, and it was believed to be healthy. Considering the advanced disease in it, it is curious that there was no enlargement; probably the left kidney disease began in exactly the same way, the abscesses gradually coalescing and finding their way through the capsule and forming an extra-capsular abscess.

P. S.—These notes were kindly given me by Surg.-Capt. Prall.

NOTES OF OBSTETRIC CASES.

BY TEMULJI BHICAJI NARIMAN, CHIEF PHYSICIAN, PARSI
LYING-IN HOSPITAL.

(a) *Notes of a case of complete prolapse of the Uterus. Delivery by Forceps.*

D. M., Parsi, ætat 26 years, 3 para, was admitted into the Parsi Lying-in Hospital on the 1st February 1898 at 9 p.m.

Duration of pregnancy.—8 months, 23 days.

Nature of previous deliveries.—Normal.

Condition during pregnancy.—Suffered from cough and dyspnœa, the uterus prolapsed completely out of the vulva up to the end of three months. Since then the whole vaginal walls prolapsed on coughing, and the cervix protruded from the vulva.

On admission the *cervix uteri* and vaginal walls were found completely prolapsed. The membranes had ruptured at home and a foul offensive discharge was oozing out of the cervix. She had no pains. On the morning of the 2nd she had a rigor, temperature rising to 104° ; at noon the temperature was 104° . Five grains of phenacetine with ten minims of tincture digitalis and a little brandy were administered by my son, Dr. R. T. Nariman, in my absence. The temperature came down to 102° at 5 p.m. Pulse 140. As the pains were slow and cervix sufficiently dilated to allow the introduction of forceps, and considering her low condition, I thought best to hasten delivery, and the child was delivered by forceps. The cervix was torn on both sides laterally. The child was still born.

As the placenta did not separate for nearly half an hour, it was recovered by introducing the hand into the uterus. Intra-uterine douche of carbolic acid, one per cent. solution, was given. As the cervix and uterus protruded out of the vulva, two silkworm sutures were applied to the lacerated cervix.

8 P.M. temperature 99° . Pulse 140. Morphia draught with stimulants and digitalis were prescribed for the night.

February 3rd.—Morning temperature normal. Pulse 110. Feels better.

February 4th.—Doing well. Quinine and ergot prescribed.

February 14th.—Sutures removed, the cervix had healed up nicely.

The uterus prolapsed on coughing, and though it was kept up by a Hoop's pessary, it prolapsed on coughing and on straining. This was the first case of suturing of the cervix out of nearly 2,200 cases in the Hospital.

(b) *Notes of a case of Twins, one of them being a Monster (specimen exhibited).*

P. S., Parsi, ætat. 27 years, 4 para, was admitted into the Parsi Lying-in Hospital on the 19th February 1898, at 1-50 A.M.

Duration of pregnancy.—9 months, 12 days. Her last confinement was nine years ago. Since that time she suffered from uterine displacement and was treated off and on for it.

Condition during pregnancy.—Was in very poor health all through, suffered from uterine pains and dyspeptic troubles, and obstinate constipation. Was very uncomfortable on account of the large size of the abdomen.

The membranes ruptured on admission, and the vertex presented. Pains were strong and frequent, and she had a very easy delivery. As the abdomen still was large a second child was suspected, and on examination something like the breech was felt. In ten minutes after the delivery of the first child she delivered this mass which is presented here. She had very easy delivery.

There was only one placenta, one bag of membranes and one cord.

The first child weighed six pounds.

Description of the monster.—The only distinct structures of the deformed mass are the lower extremities. The right foot is somewhat better developed than the left. Its second toe is wanting. The left foot is smaller. Its third and fourth toes are absent. Both the feet are thick and hypertrophied.

The legs are smaller compared in proportion to the length of the thighs and feet, they are also hypertrophied.

The thighs are extremely hypertrophied, the left being bigger than the right. The feet, legs and thighs are symmetrical, and they together form the bulk of the mass, nearly nine-tenths.

Between the thighs are the genitals in their usual place. There appears to be a small vagina, the labia on either side being distinct. Behind the vagina, a small hole can be made out, into which a probe passes $1\frac{1}{2}$ inch deep. On the top of each thigh is a small hard structure, underneath which bones are felt. There are a few hairs grown on them. The left one is larger and has more hairs on it. These may be the rudiments of the upper extremities. Between the thighs below and the rudimentary upper extremities on either side and on the anterior aspect of the mass is a sac, about the size of a hen's egg. Inside this sac are felt several cord-like structures, and from a little below its centre and in front hangs a cord which was seen to bleed a little. This sac seems to be the abdomen. On the top of all these are placed small soft structures about three in number. These are not well developed and extremely difficult to make out.

Though there was only one placenta and one cord, the rudimentary cord attached to the front of the mass must have carried on nutrition up to certain months of the intra-uterine life ; otherwise the growth could not be accounted for.

DR. TEMULJI very kindly presented the specimen to the Society, and SURGN.-CAPT. MEYER offered, with the help of SURGN.-CAPT. QUICKE to dissect it and determine the precise nature of the abnormalites. The PRESIDENT suggested that the monster should form the subject of a report at the next meeting.

*REPORT BY DR. SIMOND ON THE RESULTS OF THE
PASTEUR INSTITUTE PLAGUE SERUM TRANSLATED
AND SUBMITTED BY SURGN.-CAPT. B. B.
GRAYFOOT, I.M.S.*

Dr. Simond was sent to Bombay by the French Colonial Minister to study plague, and continued for the Pasteur Institute experiments on serum after the departure of Dr. Yersin.

The interesting report now submitted to the Society is one Dr. Simond kindly sent to the Surgeon-General. The Surgeon-General has permitted me to translate and place before the Society this report—which he thinks it would be well to publish in our proceedings.

BOMBAY, *February 2nd.*

TO THE SURGEON-GENERAL.

SIR,—The valuable aid my colleagues of the Military Sanitary Service of India have given me in my experiments in serotherapy of plague, and more especially Drs. Grayfoot, Wilkins, Mason, Smith, Lowdell, and Robertson, place me under an obligation to report to you the results of my work since the month of June 1897. This study of the properties of anti-plague serum has been directed in two different ways :—First, the curative action ; second, prophylactic action.

Action Curative.

I have treated by subcutaneous injection of anti-plague serum more than 300 sick at Bombay, Cutch-Mandvi, Karad, and Mumbra. The mean mortality for the whole of these cases has been 58 per cent.

with 42 per cent. of cures. During the same time the mean mortality which I registered in the same hospital for the cases not treated with serum reached 75 per cent., with 25 per cent. of spontaneous cures. These encouraging figures taken from all sorts of sick persons only give a very imperfect idea of the action of the serum for the following reasons.

The mortality amongst the cases not treated with serum in the hospitals where I experimented was sensibly less than the real mortality of the disease, seeing that numbers of the plague-stricken died in the city before they were discovered by the police, while almost all the convalescents were in the end discovered and brought to hospital. Thus it was that at Karad in the month of September 1897, a quarter at least of the patients admitted had already passed the fifth day of the disease and were on the way to convalescence.

2. A certain number of sick have been treated after the third or even the fourth day of the disease. Now, generally speaking, the result of the treatment at this late period is *nil*, because either the microbe has multiplied throughout the whole circulatory system, in which case death is the result after a short delay, or the natural resistance of the organism has sufficed to prevent the multiplication of the microbe in the blood and disease has spontaneously proceeded to the convalescent stage.

3. The severity of plague is very different among the various races and castes of the natives. It is for this reason that Mussulmans resist better than Hindoos, and amongst the Hindoos the resistance of the low castes is inferior to that of the higher. It is therefore absolutely necessary to establish classes among the sick subjected to treatment, and to compare results with those observed among classes of patients not treated, but under exactly the same conditions taken as controls. Proceeding in this way I have obtained the following results:—Taking a class of patients treated from the first to the fourth day, consisting indiscriminately of Mussulmans and Hindoos, the mortality has been 66 per cent., with 34 per cent. cures. At the same time and in the same hospital, the mortality of the sick admitted from the first to fourth day who have not been treated with serum has been 82 per cent., with 18 per cent. of spontaneous cures. This class consisted of 90 patients, of whom a part were treated at Kutch-Mandvi and a part at Bombay. Among the Mussulmans treated at Karad and Mumbra, and taking into consideration only those treated with serum on the first or second day of the disease, the mortality was 52 per cent., with 48 per cent. of cures. Among the

control cases observed from the first to the second day of the disease, the mortality was 75 per cent., with 25 per cent. spontaneous cures.

For the Hindoos taken under the same conditions, that is to say, only taking account of patients admitted to hospital during the first two days of the disease, those treated with serum had a mortality of 68 per cent. ; and those not treated a mortality of 85 per cent., with 32 per cent. cures among those treated and 15 per cent. among those not treated with serum. The results of these three series of experiments furnish a sufficiently clear indication of the proportion of cures which ought to be attributed to the serum. This proportion of cures among those treated is constantly higher than that observed among patients taken under the same conditions as controls.

The difference in favour of the serotherapeutic treatment is not very great, it oscillates around 15 per cent., but that is not a quantity to be despised, if one remembers that no other treatment has produced up to date any result whatsoever. This number of cures would be greater if one eliminated from the statistics the cases of pneumonic plague. In fact in this form of plague I have not proved any favourable result from treatment. The bubonic cases are the only ones which appear to have benefited from treatment. In a certain number of cases, the action of the serum is manifested very clearly by a lowering of the temperature which is permanent, whereas the ordinary morning fall of the temperature, which is observed frequently in the most serious cases of plague not treated, is generally quickly followed by a very marked rise of temperature. Surg.-Capt. Mason has collected in this regard some conclusive observations, particularly at Gaudjali, a little town in Cutch which has had a severe epidemic of plague.

In many of the cases treated with serum and cured, I have not been able to prove a marked difference in the progress of the temperature as compared with cases not treated which recovered spontaneously. I have therefore been obliged, in order to form an estimate, to choose for each class of patients treated, a class of control patients taken from the first appearance of the disease, with identical symptoms to the patients treated with serum. This procedure which I employed at Karad and at Mumbra has shown me, that the number of sick who benefit from the action of serum is less than I at first believed ; that it is moderate for the cases with œdematous buboes of the neck and nile for the cases with pneumonia. On the other hand, I have been able

also to establish the fact, that in the common bubonic type of plague, the serum increases the natural resistance in man, as it does in animals infected with plague experimentally, and treated in the laboratory. The proportion of cures which I have obtained may appear not so good as the published mortality statistics in the hospitals, which lay claim very frequently to more than 30 per cent. of cures natural or due to different kinds of treatment.

I ought to observe that these statistics are always based on the total sick admitted into a hospital. Now plague frequently kills in 48 or 60 hours, and consequently to be true, statistics of mortality, with or without treatment, ought only to be based on the sick under observation from the first two days of the attack. Without that, one would enter therein all the convalescents admitted after several days of the disease, without counting the early deaths which most frequently take place outside of hospitals. In the hospitals, where I made my observations, the proportion of deaths for all patients admitted less than three days after the onset of plague has never been less than 74 per cent. Sometimes in the hospital reserved for low caste Hindoos it has passed 90 per cent. The variability in the success obtained with serum at different times has not solely depended on the causes mentioned above, types of disease, differences of caste and race ; it has also corresponded with the difference in value of the serum I have had. Thus it is due to the superiority of the serum employed that such excellent results were obtained at Gundyali, and in a small series of 10 patients at the Kojah hospital, amongst whom there were only two deaths. In reality anti-plague serum taken from different horses and even from the same horse bled at different times does not possess at present a fixed value and curative properties. The immunisation of horses with a view to production of anti-plague serum is considered by certain doctors as a rapid and easy proceeding. Three years' experiments at the Institute Pasteur at Paris and at that at Mha-Hang, on a very large number of horses, have shown that on the contrary it is a very tedious and delicate operation. The experience gained from the treatment of the sick permit the further affirmation that the curative value of serum is very variable, according to the remoteness of immunisations and the procedure adopted to obtain it. In this regard, chemical observations are confirmed by curative experiments on animals.

By a series of experiments made at the Institute Pasteur, Dr. Roux has recently proved, that the curative power of serum does not directly

correspond with its bactericide or preventive power. Thus a serum having strong preventive action, $\frac{1}{4}$ cubic centimetre of which is sufficient to immunise a mouse against the microbe of virulent plague, often fails when mice are treated with it 24 hours after inoculation with plague serum. On the other hand, a serum with half the preventive action of the above, when injected in equal doses into mice 24 hours after inoculation with virulent plague often cures ; and has always delayed death a long time. These experiences have furnished us with the explanation of apparently contradictory results in men with the same serums ; the one with the strongest preventive action has given insignificant results, while the other, much less strongly bactericidal, has given a proportion of successes much higher than the mean. The difference is in all probability due to the fact that to cure plague the medicine requires to have more of antitoxic action than bactericidals. For several months at the Institute Pasteur the immunisation of a certain number of horses has been directed with a view to obtain a serum more exclusively antitoxic and curative by processes analogous to those employed to obtain anti-diphtheritic serum.

I have the satisfaction to state that the results obtained by Surgn.-Capt. Mason, who has very kindly treated with serum a large number of sick and communicated his reports to me, agree with mine. A portion of his results have been published in a report of Brig.-Surg.-Lieut.-Col. Wilkins, who was in charge of the hospitals of Kutch-Mandvi, where the treatment was carried out.

II. *Action Prophylactic.*

My experiments in the prevention of plague by means of serum have been made on 1,160 persons in the same districts where I practised the treatment of the sick. Among these 1,160 inoculated, I only know of nine who contracted plague within 30 days following the inoculation. In one of these cases (a writer of the Karad hospital) the interval between the injection and the onset of the disease was 14 days. The patient was injected on 7th September 1897 and fell ill on 21st idem. In two other cases at Mumbra there was an interval of 16 days between the injection and the onset of plague. For the six last cases the interval has been longer. In general I have not been able to follow up the cases for longer than a month after the inoculation. It is then possible that after this period other cases of plague have occurred amongst those inoculated. The evolution of plague in the cases collected above has been according to the ordinary type, and five

of these nine cases have been fatal, among which were the writer of the Karad hospital quoted above and a Hospital Assistant at Masur. One must therefore admit that, at the time the plague appeared in these cases, the immunising action of the serum had completely ceased. These results among men entirely agree with those obtained in the laboratory, and allow one to conclude that the injection of preventive serum confers with certainty an immunity for a minimum period of ten and eleven days. I have been able to convince myself that the use of serum as a preventive is scarcely a procedure applicable to the whole population of a town in order to prevent the spread of the plague. As the immunity obtained does not last very long, it would be necessary, in order that the vaccination should be efficacious, to revaccinate twice a month, which seems impracticable, and, as I have proved, is very difficult to accomplish. On the other hand the procedure is eminently practicable and easy as a precaution to people whose profession exposes them immediately to the contagion of plague ; *e. g.*, the staff of a hospital. It is particularly valuable and destined to render great service in safeguarding the inhabitants of infected houses. Experience has shown how, when a person has been attacked, all the members of his family and the people living in the same house are in danger. Their vaccination with serum is a guarantee the value of which I can appreciate from many recoveries.

Among other examples, I can quote the case of an inhabitant of Masur, who, the only vaccinated person in a family of nine living together, alone survived in the infected house, the eight others having contracted plague and died in the three weeks after my journey to Masur.

If one wishes to avoid having to revaccinate persons likely to contract plague, by the fact that a member of their family has been attacked in their house, they must be made to evacuate for a certain time their dwelling, in which the virus can persist longer than the immunity conferred on them by a single vaccination. Besides, this evacuation of localities is one of the first conditions to allow of the draining, disinfection, as well as the removal of rats, who are a cause of the continuance and spread of the virus. The preventive serum obtained at the Institute Pasteur of Paris during the last months of 1897 was endowed with a bactericidal power so strong that a cubic centimetre diluted in a little water suffices to vaccinate 50 mice ; that is to say, the quantity of serum, sufficient to prevent in the animal the development of a virus capable, without it, of killing it in 40 hours can be estimated

at half a drop. The vaccinations are made by injecting under the skin of the flank a dose of serum consisting of 10 cubic centimetres by means of sterilisable syringe. I have often used needles of small calibre, with which the prick is scarcely perceptible to the patient.

In 21 cases I have noticed transient symptoms, such as fever, pain in the joints, and swelling of glands. I have been able to satisfy myself that these symptoms which have been of short duration, and have never obliged the persons vaccinated to remain in bed, arise from the fact that the horse which had furnished the serum had been bled too soon after an injection of serum, at a time that his blood still had feebly toxic properties.

In a single case it caused an abscess consecutively to the injection (in the case of a Mussulman at Kutch). The cause of the abscess could only be attributed to the impurities met by the needle on the skin of the patient, which were introduced into the tissues by the puncture. The injection had been made by a new assistant, who had neglected to, first of all, render aseptic the skin of the part to be inoculated. This is a precaution which one ought never to forget. In all the other cases after the injection prophylactic no other symptom or indisposition worthy of note ever occurred. From the first to the fourth day frequently for some hours a feeling of fatigue supervened, but that was an absolutely harmless result which did not prevent the patient from attending to his ordinary duties. In conclusion, I must express to you my gratitude for the cordial welcome which I have always received from the officers serving under your orders and for the facilities they have given me in the accomplishment of the mission of study entrusted to me by his Excellency the Minister for the Colonies and by the Institute Pasteur.

I beg to remain, &c.,

L. SIMOND,

Director of the Pasteur Institute at Saigon,
Doctor of the First Class of the Military Sanitary
Corps for the Colonies.

SURG.-CAPT. GRAYFOOT mentioned that Dr. Simond has only now returned to India and has proceeded at once to Karachi with a supply of new serum, which possesses a much higher antitoxic power than the serum formerly used. It appears that an antitoxic rather than a bactericidal serum is calculated to cure cases of the disease.

Friday, July 1st, 1898.

[Vol. II, No. 7.

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE usual Monthly Meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, 1st July 1898, at 5-15 P.M.

Surgn.-Major-General G. BAINBRIDGE, President, in the chair.

Present : Surgn.-Col. G. W. R. Hay, Surgn.-Lieut.-Col. W. K. Hatch, Surgn.-Major W. H. Quicke, Surgn.-Capt. C. H. L. Meyer, Surgn.-Capt. S. E. Prall, Surgn.-Capt. L. F. Childe, Brig.-Surgn.-Lieut.-Col. T. S. Weir, Dr. A. H. Deane, Dr. L. P. Do Rozario, Dr. D. R. Bordi, Dr. R. M. Kalapesi, Dr. Temulji Bhicaji Nariman, Dr. Ismail Jan Mahomed, Dr. (Miss) Gertrude Bradley, Dr. (Miss) A. M. Benson, Surgn.-Major J. J. Bourke, Surgn.-Capt. J. G. Hojel, Surgn.-Lieut. S. Evans, Dr. D. A. D'Monte, Dr. C. B. Stewart, Dr. N. N. Katrak, Surgn.-Capt. C. J. Milne, Dr. (Miss) Carthorn, and Surgn.-Capt. H. Herbert (*Honorary Secretary*).

Business :—

The following papers were read :—

1. Reply by Surgn.-Capt. G. S. Thomson, I.M.S., to Surgn.-Capt. J. B. Smith's criticisms.
2. Notes on the Epidemic of the Plague in Sind, 1896-97, by Surgn.-Major-General G. Bainbridge.
3. Report on the Monster exhibited by Dr. Temulji Bhicaji Nariman, by Surgn.-Major W. H. Quicke, F.R.C.S., and Surgn.-Capt. C. H. L. Meyer.
4. A case of Insular Sclerosis, by Surgn.-Capt. S. E. Prall, I.M.S. Surgn.-Capt. Prall also exhibited a case of skin affection consisting of patches of atrophy with pigmentation.

Reply by SURGN.-CAPTN. G. S. THOMSON, I.M.S., to SURGN.-CAPTN. J. B. SMITH's criticisms, published in Vol. II, No. 6, May 1898.

It was in no spirit of carping criticism, or for the purpose of detracting from the deservedly good and successful work done, but merely to illustrate a fact that I incidentally alluded to Karad plague results

in my paper in March. It was officially reported to the Civil Surgeon of Satara before I read and wrote my paper that 3 indigenous cases of Plague had occurred in Karad town. Those who know me best will be the last to accuse me of trying to build up my reputation at the expense of a colleague, and it was never present to my mind to disparage anyone's good work at Karad or elsewhere ; and I therefore pass over references to such terms as " jibe " and the remarks about " N. B., &c.," with an absolute disclaimer of any such motives in what I wrote, and an assurance that there can be no offence where none was intended.

Taking the criticism para. by para., I proceed to reply :

1. That Mr. Brady has been held up by others as the supervisor of disinfecting operations in Karad, and up till lately I and all officials here regarded him in that light and understood that he had been sent to Satara as a trustworthy disinfector.

Whatever credit Dr. Smith takes to himself regarding disinfecting operations in Satara and the making of the work of disinfection easier, he is free to claim. For myself I am not afraid of the comparison tacitly challenged between Satara Plague operations and those anywhere, but laid no claim to special merit in my paper, and instituted no invidious comparisons. I wonder will Dr. Smith be so ready to champion disinfection, say in October next, when Plague will possibly and probably prevail with re-doubled fury in both Satara and Karad.

To other measures, in addition to and apart from disinfection, the speedy termination of the Satara epidemic and the lessened number of victims in comparison to its population were due ; and premature claims to success owing to disinfection work only lay one open to ridicule (as in the cases of Karachi and Poona), when the disease breaks out with increased violence afterwards.

2. I admire the thoroughness with which a belief in disinfection actuated on Plague measures in Karad, and expected nothing else from Surgn.-Capt. Smith's administrative ability and energy ; but he did not possess a monopoly of that admirable quality, for disinfection was carried out equally conscientiously in Satara. The immunity from a fresh outbreak could be attributed to this measure.

3. I am in full agreement regarding the slackness of coolies, and often found them, even those trained at Karad, when at work in Satara grossly abusing every principle of the careful use of disinfecting solutions.

To enumerate only a few abuses noted. Often and often has the pump coolie placed the pump on a dirty floor and then replaced it covered with dirt and mud in the tub holding the perchloride solution. Many times have I kicked over an iron or zinc untarred bucket holding the solution. Often have brass pumps been used which in a few days, even with oiling, &c., have become corroded and useless from the corrosive action of the solution. Will Dr. Smith venture to assert that ten per cent. of the active agent ever found its way through such a pump, and with such carelessness as to details? If not, how can reliable disinfection have been carried out in this manner? Yet it is to such human agencies liable to error that one must entrust the details of practical disinfection, and no amount of personal supervision could prevent such abuses in practice. With fifteen gangs at work it is a matter of physical impossibility for the supervising Medical Officer to personally see them all once a day, and perform other duties besides, equally important and pressing.

4. Regarding deaths among the hospital staff at Karad, will Dr. Smith assert that no other necessary reforms were introduced by him except the use of disinfectants? Had there been no overcrowding of the hospital previous to his advent? Was it a *sanitary* Plague Hospital before he put it in order, with, *at the most*, hospital accommodation for 77 patients—"while the number actually rose to 146" !!!—as Dr. Smith states in his administration report on Karad? And with 730 deaths in August, was the hospital over-filled? Were the dead always removed at once from the hospital during the acme of the epidemic? And did not the above report state that parts of the hospital were ill-ventilated? No wonder some of the staff got Plague and died of it—rather the wonder is that more did not. Again, how did those who unfortunately were attacked live as regards air, light, and ventilation, and those conditions which, I contend, favour an attack of Plague? Could such attacks take place in a sanitary Plague Hospital? I trow not, disinfectants or no disinfectants. All who have written hospital reports confirm Parel and Satara Plague Hospital experience; and in the latter practically no disinfectants were used. I am not afraid to put my own convictions to the severest test and don't use for myself dipping in perchloride and other.

such precautions (?), and others have done so repeatedly with complete immunity. To attend plague patients in their own houses is a different thing, and an occupation which I would think twice before engaging in at all, for to my mind it is proven that it is a disease of locality rather than of person and that its infectiousness is limited by sanitary conditions.

In the administration report on Karad Hospital "The structure of the building did not admit of any proper through ventilation in any of the wards, and absolutely none in most," occurs. Regarding another hospital he states "the others being closed stuffy rooms." . . . "They had been worse, but Surgeon-Lieut. Kukday had had windows opened in them."

Regarding the comparative immunity of Europeans now and in the past I am unable to prove that Europeans lived under the same sanitary conditions as regards ventilation (although from the Barracks Commission Enquiry and the old Barracks, *e. g.*, in Bombay, now used as Commissariat godowns, we may infer that ventilation was not as well provided for in the past as now), but we do know from certain annexe to bungalows that the relations of Europeans with certain classes of natives was one of greater intimacy than happily prevail now-a-days. This may have led (as in Parel Hospital it undoubtedly did to 3 sepoy ward-orderlies being attacked) to Europeans falling victims in previous Plague epidemics.

5. Prisoners are not allowed to be filthy, neither are they allowed to crowd their cells and shut their doors and windows by night; besides filth of person, clothing and surroundings foul the air one breathes just as much as, perhaps, overcrowding and deficient ventilation, and hence the reference to filth in this connection. Whatever devitalises the air seems to make that place a fit emporium for Plague attacks.

How does Dr. Smith attempt to explain why 166 clean Brahmins were attacked in Satara, equal to one-fourth of the total attacks almost if he still has a lingering belief in the filth theory of Plague? What about the sailor population in Bombay, native and European, as long as they remain on well-ventilated ships? The Brahmins make up about one-fifth of the population of Satara, but the majority of them fled (courageous fatalists) on the appearance of the epidemic; hence their proportionately large number of attacks is the more inexplicable

except on my showing. The exception of sailors has been commented on by De Foe in his history of the London Plague of 1665-1666.

6. The exemption of Wai can, as Dr. Smith points out, be explained on my views, and it was to challenge such criticism that I loosely instanced Wai, so that the champions of the filth theory might explain its exemption on their grounds. No doubt when the torch comes to the gunpowder which is superabundant there Wai will suffer terribly, for I have just visited Wai as Civil Surgeon and find all the conditions ready for the precipitation and propagation of an epidemic of Plague there. At page 9 of the April number Dr. Weir shows that the best ventilated parts of Bombay were the least affected, and the same is true everywhere, and at all times historically true, as the records prove. Even were a case or two found among Byragees that would not disprove the truth of the general assertion that they are usually exempt; yet some of them, perhaps most of them, are filthy in the extreme. Did I not also point out exceptions amongst people whom I generally claim to be exempt as long as they live under ideal sanitary conditions, when they abuse the means of ventilation? Others have noted the same.

The escape of the Cantonment from an epidemic although Plague was introduced in two places is passed over in silence. The immunity of the Sudder Bazaar, where it was five times introduced, of the Jail, where 5 Plague rats were found on three separate occasions, and an undoubted case in the Jailor's house next door are too strong to be refuted. If what I contend has not protected ourselves and others in all those and numerous other instances, how does Surgn.-Capt. Smith explain such exemptions to his own satisfaction?

The want of fresh air theory is the only one that explains all the facts now; and was not put forward on "hasty and unwarranted conclusions," but only after six months' work, experience, and study in the particular disease under discussion.

7. The value of perchloride of mercury in Plague internally stands on totally different grounds from its use as a disinfectant and is based on clinical experience. At page 71 of General Gatacre's Report the evidence required by Surgeon-Captain Smith is recorded of the use of perchloride of mercury hypodermically without salivation being produced, and at page 88 the *usual* dose (one drachm) is mentioned as having been injected: at page 82 a dose of 50 ms. was injected in a boy of 14, and page 83 records the fact that there was no salivation.

As I am rather a sceptic in medicine, and simply recorded the results of clinical experience and the news of others regarding this mode of treatment, I am free to state that if some more enthusiastic believer in drugs had introduced it he would have lauded it to the skies.

At page 70 of General Gatacre's Report salivation followed in a suspected case which was proved by bacteriological means not to be Plague ; so that the quality of the drug used cannot be impugned ; and this was not the only non-plague case in point in which this ensued. Upon a careful review of the phenomena of the disease in its course to recovery or death, it is but too plain that *remedial* measures have as yet had scarcely any control over Plague, although the value of removal to hospital, with its concurrent better sanitary conditions, careful nursing, and the comforts of a good bed, cannot be doubted.

In the graver forms, medicine has been confessedly useless ; in the milder, it was probably unnecessary ; in the intermediate shades it may have had some influence. The first ten cases of Plague I ever saw I treated with diaphoretic mixture—6 of them died and 4 recovered ; this probably represents the mortality of cases that reach hospital when left to the efforts of nature. In an hospital in Bombay 9 European Plague cases were shown to M. Yersin, but he declined to inject his curative serum, yet 8 of them recovered ! Had he injected serum all my careful observations at Parel on the use of his curative serum would have been open to grave discredit.

In Plague if the medical attendant can enable the shattered barque to weather the gale he may hope to reach the desired haven, to use an old simile, of safety and restoration to health.

8. Surgn.-Captn. Smith believes in chemical disinfection properly carried out, and instances Karachi, Poona, and Bulsar as practical proofs of its utility. Unfortunately Plague has broken out with increased virulence (because of disinfection one might almost, though baselessly, argue) in each of those places. Nowhere could disinfection have been more thoroughly and properly carried out than in Karachi, the stock place up till now quoted by the Plague Commissioner and others as evidence of its value, where the very donkeys and goats went through a disinfecting bath before being re-admitted to the town. Just now the state of Karachi is a final reply to such boasted results ; not to instance Hongkong, Mandvi (Cutch), Bandora, Surat, &c., &c.

If disinfection by chemicals is reliable, why should there have been a recurrence ? Perhaps its advocates may say, "You expect too much

from disinfection ;” but that feeble excuse cannot hold for a moment and is not required to support what I contend are the only sound and reliable measures which, if universally adopted, enable every one and every place to withstand the introduction of Plague. Do not forget the two instances quoted from Dr. MacCartie’s report of Plague introduced into sanitary well-ventilated ships that failed to spread.

Manson’s “Tropical Diseases” (p. 152) states: “Experience has shown, that in sanitary hygienic conditions Plague does not spread even if introduced, and that in opposite conditions it may for a time spread like wild fire.” At page xvi (Introduction) he says speaking of leprosy and Plague, and practically repeats the same regarding Plague at p. 144 : “They have been practically ousted from Europe and the temperate parts of America ” [by disinfection ?—No] “by the spread of civilization, and the improved hygiene that has followed in its train ; and are now practically confined to tropical and sub-tropical countries, where they still survive under those backward social and insanitary conditions which are necessary for their successful propagation.”

It was from the very opposite reason to that quoted, *viz.*, “that a given chemical in a solution of given strength fails to kill the bacilli in a test tube,” that I induced Mr. Hankin to try and kill the bacillus *under conditions similar to those in actual practice and in Nature* with approved disinfectants of the pest bacillus under laboratory tests. See his Report, and my criticisms on it written in February 1898 (*Times of India*),

My conviction is that disinfection *alone* cannot make a town Plague-proof or eradicate the disease. The Bombay Plague Report proved it *on paper*. What is eradicating the present Bombay plague to nearly vanishing point ?

Whether my conviction and its declaration in the interests of science “are calculated to embarrass the work of officers whose duty it is to carry out disinfection ” I care not, if my urging another really remedial means leads the authorities to modify that confessedly discredited measure. I asked Dr. Koch why he approved of perchloride disinfection in Plague, and his answer was “on grounds of analogy only.” Is that enough, no matter by how great a master it be uttered ? I am not bound to swear in the words of any master, but want proofs and tests under practical conditions. I am not worthy to unloose, as a Bacteriologist, Yersin’s shoe laces, but I can judge of his assertions and test

his results clinically. There is no use in throwing water on a drowned rat, for in practice disinfection has proved unreliable, and every day is carrying the proof to absolute demonstration.

Has Dr. Smith considered that chemical disinfection in a laboratory is carried out (1) with chemicals of tested purity, (2) mixed with sterile distilled water generally, (3) pure cultures of the micro-organism are used, (4) Dr. Smith himself points out that HgCl_2 is changed into HgO_2 (and are not many houses colour-washed before disinfection is begun?) by whitewash. Again one may disinfect everything one finds and yet leave out the infected rag, &c., so that disinfection is love's labour lost in that case.

Cannot the results in Karad be looked at from another point of view? Evacuation had taken place till at one time the roughly estimated population was about 1,500 people instead of 12,086 or more. Only 31 persons left the town *after* disinfection was begun. The population was increased over normal by refugees from Poona and Bombay chiefly, who brought the seeds of the disease with them. The epidemic had spent itself and killed off those susceptible, then general disinfection was completed and gets the credit altogether. No share of success was due to evacuation, lessened virulence, diminution of overcrowding, &c. It is to be noted that up till 29th January 1898 as many as 3,014 persons returned to Karad. The general disinfection of the town was started on the 26th September (as per Administration Report), during which week there were 28 attacks and 12 deaths in the town instead of 216 and 128 respectively in the week ending August 28th, that is, the disinfection was begun during a rapidly declining epidemic. The same story is borne out by Satara experience: plague ceased to be epidemic on the 19th March yet disinfection was not completed till the 20th April. How then can it have caused the cessation of plague? *ante hoc ergo propter hoc*.

9. I do not for a moment contend that $1\frac{1}{2}$ sq. ft. is sufficient for efficient ventilation; but I am strongly of opinion that such apertures kept permanently open are better than windows that will be kept shut. Besides, further on in my paper I referred to one U. H. H. Committee which laid down the rule that one-fourth of the superficial area should be ventilating apertures; so that those temporary expedients (all that could be done rapidly and at the time, taking into consideration the opposition and temper of the populace) were by no means the final pronouncements of Satara's scientific advisers in measures for

improving the insanitary condition of its houses as regards light and air. The U. H. H. Committee, however, has no power to enforce such high-ideal measures and the supineness of the Municipality in such matters (they have no money, but disease is the most expensive of all visitors, especially epidemic disease) is such that our recommendations are proving a dead letter and our elaborate measurements merely filed for record. Nay more, houses are permitted to be built now under the eyes of this Municipality without any adequate measures for their ventilation. What is wanted is a Government strong to devise and resolute to enforce a law compelling houses to be built or remodelled on proper sanitary lines. The trust of the people in Government measures of disinfection has led public opinion away from the true line of safety, effectual in the past, patent for the future, and reliable in the present epidemics ; and which will enable every place to resist the invasion of such a fell disease.

I believe in altering the environment, which has been proved to cause the death of the germ and enable us to mix freely with infected persons without any danger to those who know the value of such reliable precautions. Very often I have doubted my own convictions and submitted them to fresh analysis. It does seem incredible that the incidence and spread of such a dreadful malady should depend pre-eminently (I did not say "entirely") on a want of fresh air ; but when one reflects that one may live 20 to 40 days without food, 7 to 9 days without food or water, and not for 5 minutes without air, the vital importance especially of fresh air is borne in on one's reflecting understanding with amazing vividness.

I have thus tried to vindicate my theory, however imperfectly—a theory which increasing daily experience has the more fully confirmed and which no one will be more ready to give up for a better one when its premises are shown to be false, and its conclusions belied by the records of the past. As related by Nathan ("The Plague in India, 1896-1897," pp. 46, 71—94), past experiences and records confirm my views, and a visit to Karad town last week made me practically aware that suitable conditions exist there for an outbreak, as not 2 per cent. of the houses have even one window, and there are not 5 houses, as regards ventilation, in the whole place fit for human habitation. No town, not even Satara, could furnish such a large number of air-tight houses or be a better example of the existence of those conditions which I venture to espouse as the chief factors in the cause of the incidence of a plague epidemic.

NOTES ON THE EPIDEMIC OF PLAGUE IN SIND,
1896-1897.

BY SUGN.-MAJ.-GENL. G. BAINBRIDGE, M.D., F.R.C.S.I.

I PRESENT to you extracts from an official report on the first epidemic of Plague in Sind (submitted by me when I was P. M. O. of that province), with the addition of a few introductory and concluding remarks.

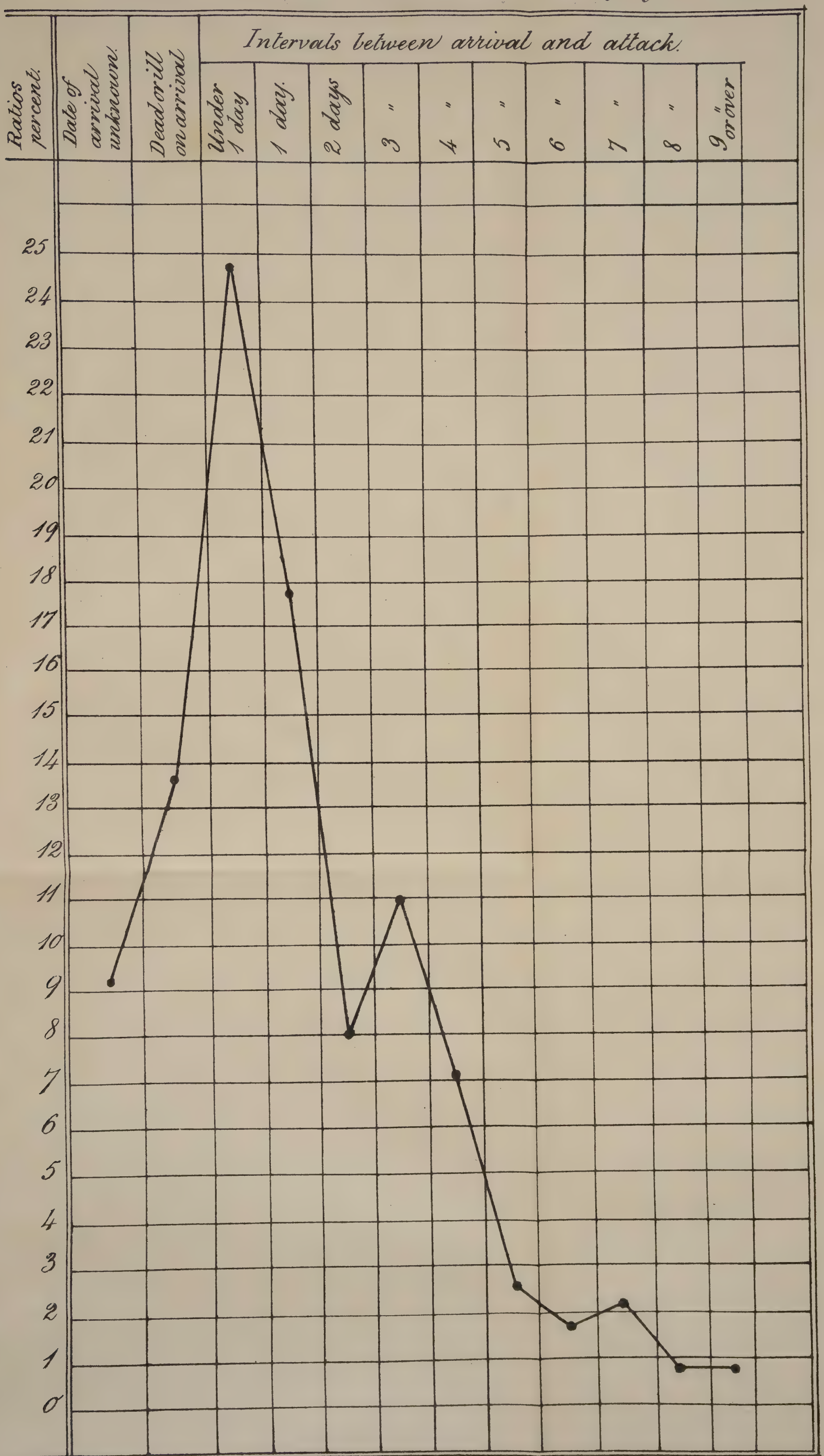
The information received from Medical Officers and others regarding Plague epidemics in other districts is so extensive, and its sources are so numerous, that its compilation has not yet been possible. Some interesting and valuable papers have already been communicated to you by members of this Society ; but I fear it may be long before the experiences of all the workers can be collated, and deductions be drawn from complete data.

The bulk of the records for the Presidency, as a whole, is alone a sufficient reason for restricting the limits of my paper ; for, were it to include references to our later experiences, it would become of very inconvenient length. I fear, indeed, that my present contribution may be found to have this fault.

My report is dated October 25th, 1897, that is just before I took over my present office ; and is therefore the earliest complete account by a medical man of any outbreak outside the City of Bombay. But I only draw attention to this in order to remark that the information since recorded by officials, both in Sind and the Presidency proper, has, with only slight, if any, exceptions, fully confirmed the views which I then formed regarding certain features in the habits of Plague and the general principles on which an epidemic of this disease should be managed.

I have been pleased to find that these principles which were early advocated by my predecessor, and which had been independently followed in practice elsewhere—with certain limitations—have since received the almost unanimous support of those members of our profession and of the Civil Service who have had the best opportunities of putting them to the test, or of drawing conclusions from the facts presented to them by others.

The period of incubation in Plague.
Chart showing the percentage of 235 imported cases (Statement E) attached on each day after arrival.



I must crave your indulgence for the somewhat disjointed character of what I have to say, due mainly to pressure of work and to the causes above named.

I venture to think, however, that the report from which I give extracts has, at least, this value, *viz.*, that it was written, whilst the facts were still fresh in my memory, from personal observations or knowledge or from official reports, the details of which were at once carefully sifted and corrected by myself.

The first known case of Plague in Sind was reported by the Municipal Health Officer of Karachi on the 10th December 1896. It was quickly followed by others, so that by December 18th there had been at least 23 reported attacks and 16 deaths.

There was some hesitation on the part of the Municipality in declaring the nature of the disease, but the Permanent Medical Board, which met on the 19th December, had no difficulty in pronouncing it to be Plague. The deaths from this cause amounted, by that date, to twenty-two, and the weekly mortality had risen from 32 to 52 per 1,000, the mean of five years being 46. The way in which Karachi was infected was not traced, but its importation by sea was clearly possible, for the voyage by steamer lasts but three days at most, and there was no detention except in the case of vessels which had had a case on board or which carried no doctor.

On the 20th December I met the Municipal Health Officer, and with him saw two undoubted cases of Plague in the city, and on the 23rd I saw two or three other cases. On January 3rd the Commissioner in Sind arrived, and at his request I visited the town with him, the Collector, the Deputy Sanitary Commissioner and the Municipal officials. We found that the streets in the infected quarter were being watered with a disinfectant solution, and that infected houses were whitewashed and their floors and walls thoroughly sprayed with corrosive sublimate solution. There was not then, however, any restriction upon the movements of the inhabitants. All infected houses were specially marked. At this visit informal discussions took place regarding measures to be adopted, and particularly in reference to the compulsory inspection and disinfection of houses and the provi-

sion of the staff required for the purpose. Even then many houses had been shut up by persons who had fled, and presumably some of these were infected. I made a verbal recommendation to the Health Officer of the Municipality to remove from the town and segregate the inhabitants of the infected quarter. On this occasion I saw several more cases of Plague, and the total of recorded attacks up to this date were 104 with 100 deaths.

On January 4th I attended a meeting of Government and Municipal officials assembled by the Commissioner in Sind. The Civil Surgeon and the Deputy Sanitary Commissioner were present. The measures necessary for adoption were discussed, especially compulsory notification of illness and deaths and segregation of the infected. I agreed that both were necessary, but gave my opinion that compulsory segregation or removal of the sick to hospitals would probably lead to resistance, and that an attempt should be made to persuade the people to adopt it voluntarily. The opening of private hospitals within the infected quarter was approved. I suggested the advisability of carefully controlling the water-supply of the town so as to limit the dampness caused by waste, and the Municipal Secretary undertook to arrange this.

Within the next few days a health camp was formed on the right bank of the river Lyari for a sect of Hindus known as Nussurpuris, who were among the most numerous inhabitants of the infected quarters and had suffered severely and who were much overcrowded. These people moved into camp on the 22nd January 1897, after much persuasion, and remained there until 15th May 1897. The largest number in the camp at one time was 2,500, the lowest 1,200. They occupied about 480 huts, which were made of light poles and bamboo or reed matting with roofs of mud plaster. Each hut was twelve feet by ten feet, and one or two were allotted to each family, the rows being thirty feet apart, with ten feet between each hut.

All the arrangements, both as regards construction and management, were carried out by the Municipality with the aid of the Collector. Water pipes were laid on to the camp, which was also provided with the necessary shops, hospital sheds, stone platforms for washing and bathing, boilers for disinfecting clothes and separate latrines for men and women. Segregation was for some time very imperfect, owing to inadequate supervision and guarding.

There was free intercourse with the city, many people going daily to their business and to market there, and visitors being allowed to enter the camp. The result was the occurrence of 83 cases of Plague, the last of which was attacked on 31st March 1897—that is, 69 days after the camp was opened. Of the total number, 62 occurred after the tenth day from the opening. The camp was finally closed on the 15th May 1897.

The Municipality adopted vigorous measures for the disinfection of plague-infected houses and for the cleaning of affected quarters of the town; steps were also taken to discover cases of Plague and to check the mortality returns. But no restrictions were placed by the Municipality on the movements of the people. There was much concealment of cases and of deaths, and their discovery was one of the chief difficulties, especially in the beginning. In a short time, however, when each section of the town was placed under a staff of officials, when the population had become largely reduced by migration and the people less averse to supervision and enquiry, very few cases escaped detection. Still, it is remarkable that attempts at concealment continued to the end.

The appended statement (No. I) shows the number of attacks and deaths in Karachi during each week of the epidemic. More than half the total had occurred by the 4th March. The maximum severity was reached in the week ending 4th February (321 cases). The first decided indication of decline was noticed in the week ending 8th April (215 cases). On the 6th May the number had fallen to 82, and on June 10th to 9 in the week; then 5, or under, in each week until July 31st. The earliest recorded case, as already mentioned, was reported on the 10th December, but, so far as I know, the first case in which the local epidemic originated has not been traced. The mortality returns give no indication of any epidemic until the week ending December 17th, 1896, in which the first cases were recorded. It seems, however, to be not improbable that cases of plague had occurred considerably earlier. Many persons had come from Bombay since the latter place was infected, and it is most unlikely that no Plague-stricken persons should have reached Karachi before the beginning of December. At any rate, germs of the disease were probably imported some weeks prior to the 10th December.

The rate of advance of the disease from one quarter of the town to another was very slow, as compared with the increase in numbers

in particular quarters, when once the disease had become localized. For about six weeks the Plague was almost entirely confined to the several divisions of the oldest and most crowded portion of the town, spreading rather slowly from one quarter or street to another. By the 20th January 1897 the whole of this part of the town was involved and 564 cases had occurred, or rather more than one-eighth of the whole.

The epidemic spread steadily, but not rapidly, to other adjacent quarters. But with regard to those which are more distant, or isolated, from the original focus, the following facts may be of interest :—

| Name of Quarter. | Date of first Case. | Plague became epidemic. |
|--------------------|-----------------------|------------------------------|
| Lyari | 29th December 1896 .. | 3rd week in January 1897. |
| Rambagh | 8th January 1897 ... | 3rd week in February 1897. |
| Garden | 10th do. ... | 2nd week in February 1897. |
| Khuddah | 18th do. ... | Do. do. |
| Runchore | 25th do. ... | 3rd week in February 1897. |
| Keamari | 2nd February 1897 ... | 1st week in March 1897. |
| Sadar Bazar | 24th do. ... | } Never truly localised (?). |
| Cantonment | 20th March 1897 ... | |

The Lyari and Khuddah quarters are separated from the old town by the bed of the Lyari river. The population of the former consists mainly of Makráni, Sidi and Pathán labourers, who are comparatively poor, are dirty in their habits, and live in huts which were somewhat crowded and not raised above the ground. The residents of the Khuddah are Mahomedan fishermen whose condition of life is considerably better. Their huts are, however, more crowded and insanitary, and, being nearer the harbour, are on very damp ground. The population of the Lyari quarter in 1891 was 22,000, and is now estimated to be nearly 30,000. The cases of Plague recorded in this quarter were 1,193 with 893 deaths, or more than one-fourth of the whole in Karachi. Notwithstanding the conditions just mentioned, it is found that the disease had not localised itself until four weeks after the occurrence of the first case in the quarter.

The Rambagh quarter is an open locality with a mixed population, living under comparatively good sanitary conditions between the town and Cantonments, but separated from the latter by about 400 yards. The Plague attacked the lower classes of Hindus, Native Christians and

Jews, but did not take a firm hold of the locality. The outbreaks here were, however, vigorously dealt with. The Runchore quarter is some distance from the old town, and to a certain extent cut off from it by open ground, but the intercourse between the two is free. This quarter has sprung up in recent years; but though the streets are wide, the buildings of good structure and mostly roomy, yet sanitary details have been neglected in their erection. The Plague became epidemic towards the end of February, and the locality furnished rather numerous cases.

Keamari is separated from Karachi by a creek which is crossed by a road and bridges. The inhabitants (about 2,000) are similar in character to those of the Lyari and Khuddah, and live under like sanitary conditions. The place had 122 cases with 73 deaths. The first case occurred on the 2nd February, 3 more on the 16th and 19th February, 2 on the 27th and 28th February; but the disease was not truly epidemic until the first week in March.

The Cantonments and Sàdar Bazar form the most easterly part of Karachi, but are not quite isolated from it as regards continuity of buildings. The two quarters are contiguous to each other and yet not entirely distinct.

The Sàdar Bazar is under municipal management, and though its streets are wide and well arranged and many of the houses built of good materials, most of them have serious sanitary defects, and large numbers of the inhabitants are poor or of dirty habits. The plague reached the Sàdar Bazar on February 18th and between that date and the 20th March 7 cases occurred. On the 14th March a case occurred in Cantonments among the sweepers of the 1st Wiltshire Regiment, probably conveyed from the railway lines or from the town. Both the Sàdar Bazar and Cantonments seem to have received more than one separate infection from the town. About 6 other cases occurred among these sweepers, but the outbreak in Cantonments was mainly confined to the Royal Artillery syces, Commissariat drivers, dooly bearers, sweepers, and a few private servants. No soldiers or Europeans were attacked. The cases in Cantonments numbered 86, and in the Sàdar Bazar 116. In neither locality did the epidemic ever obtain a firm footing, for each case was removed as it occurred, and each infected dwelling at once vacated and either destroyed or disinfected. During the month of February the Sàdar Bazar had, on

my suggestion (dated 30th January) and by request of the General Officer Commanding, received a thorough inspection and cleansing, large quantities of rubbish being burnt or removed.

The Plague therefore spread slowly through Karachi in all directions and a period of about one month from the date of origin of each new focus was necessary for its establishment in fresh localities. This appears to agree with the information collected by Surgeon-Captain Grayfoot as to the interval which occurs between the first imported cases and the outbreak of epidemics in towns and villages.

The intensity of the epidemic was doubtless modified in some quarters of Karachi by the exodus of the people ; yet it did not seem as if density of population and a marked absence of sanitation were the sole factors in favouring local outbreaks. Of such, several occurred among the residents of buildings which were well constructed, in dry situations and not closely packed. In most of these there certainly were, according to western sanitary ideas, a want of light and air ; yet in ordinary times many infected dwellings would not have been condemned as insanitary for Indians, either in themselves or as to their surroundings. The occupants of upper storeys had no immunity from attack, when they were uncleanly in their habits or overcrowded or the privies defective or ill-kept. These conditions are only too common. The space allotted to the privies is invariably inadequate, their structure is such that they cannot be kept clean, and they are ventilated into the houses. These defects, together with uncleanly habits, combine to make these places abominable and dangerous. I am bound to add that in the part of the town which has been recently drained, several hundred privies have been connected with the system, and that this improvement, though slow, is in progress. It was greatly interrupted by the Plague epidemic. It was, in fact, made clear that, among people of uncleanly habits and living as the humbler classes of natives usually do, a good house and fairly clean surroundings with an absence of house privies gave no guarantee of protection. For this not only are a sanitary dwelling and surroundings necessary : perhaps quite as essential are the greatest personal and domestic cleanliness and precautions as regards the mode and duration of contact with Plague-stricken persons or dwellings, especially the avoidance of prolonged stay in infected rooms or privies. Apart from the structure and position of the dwellings and the presence or absence of dirty privies and overcrowding, other common defects in native houses here

are soiling of the floors and the adjoining ground with human and animal excreta and vegetable refuse, and the accumulation of old and dirty clothing and all kinds of rubbish.

At first, though arrangements were made for hospitals which could be increased as required, the sick would not go to hospital, nor were they compelled to do so. During this time most of the sick were seen at their houses by Surgeon-Lieutenants Niblock and Cornwall, I.M.S. (Madras). Later on they began to go more willingly, and subsequently compulsion was adopted. The main Plague hospital was established in the Civil Hospital, the ordinary patients, the dispensary and offices being transferred to an adjoining school house. It was in charge of the Civil Surgeon, under whom was placed Surgeon-Lieutenant W. J. Niblock, who was in immediate charge and did almost all the work. The first patient was admitted on 1st February, and the last was discharged on 6th August 1897. A total of 515 cases were admitted. Surgeon-Lieutenant Cornwall, who had been working from house to house in the Lyari quarter, was placed in charge of the hospitals and health camps there. The cases treated under him numbered 341. All these hospitals were equipped by the Municipality and from a fund subscribed in the town ; but I exercised supervision over them.

Private and caste hospitals were also established, but though I visited two of them once each, they were not under me. They did not seem to be under proper control or management. I paid twenty-five visits to various parts of the town and the health camps until the Plague Committee took charge of the operations, and visited the Plague hospitals abovenamed on twenty-six occasions up to the 21st July 1897.

The Municipality took energetic measures towards effecting segregation by erecting 2,582 huts, of which 2,270 were put up before the Plague Committee was appointed. Owing to the nature of the country and the difficulty and expense of providing water, it was not easy in Karachi to find sites for all these huts.

Disinfection of clothing and the destruction of infected huts and other articles were well carried out. Unfortunately during many years past large numbers of huts built under municipal permits, on temporary occupation leases, had been erected without plinths and with inadequate attention to their arrangement and their proper maintenance. Their sanitation had been neglected, and overcrowding had been allowed ; for, though the main streets were fairly intact, more persons

than permissible were occupying each plot. There were also a good many minor encroachments. I suggested wholesale removal of the occupants of huts in insanitary localities, such as parts of the Lyari quarter ; but space and funds were wanting, and, with the exception of the Nussurpuris above alluded to, it was not found possible, as a rule, to do more than segregate the occupants of infected dwellings and of those actually contiguous to them.

The total recorded cases of Plague in Karachi, including Cantonments (86 cases), were 4,155 with 3,380 deaths. The last attack was reported on July 27th.

One case of Plague occurred in the Karachi Prison on the 21st February 1897. The convict had not been outside the prison since his admission five months before and was confined in a barrack with about twenty others. I saw the man with the Medical Officer of the prison on the morning of his attack, and we decided to remove him to the Plague Hospital. After careful investigation we could arrive at no certain conclusion as to the mode of infection. The evidence, however, showed that, until the 14th February, four Warders had been living in infected parts of the town, and that several cases of plague had occurred in two localities, distant 38 and 83 yards from the prison from which the germs may have been blown or carried. Another possible mode of entry was, as I suggested, in the soil carried in upon the shoes of Warders and, I might have added, on the feet of conservancy convicts. I found close to the convict's berth an earthen water-vessel which had leaked, causing the floor beneath it to become damp and a favourable site for the development of germs ; but this condition was not peculiar to that particular spot.

All extra-mural labour, except that of the conservancy gang, had been stopped since December 1896 on the outbreak of plague in the town. The barrack was first thoroughly disinfected with corrosive sublimate solution, then vacated and unroofed, and the floor dug up. No more plague occurred in the prison.

From March 24th 1897, the Plague Committee was appointed. The Committee entered upon its duties at a time when, although the epidemic was less severe than it had been, the number of weekly attacks was about stationary. In a month its operations were followed by a marked decline in the numbers, and in two months the weekly attacks were reduced from 271 to 40.

The conditions under which the Committee began the work assigned to it were favourable ; for the Municipality, with the help of the Collector, the Deputy Sanitary Commissioner and special assistants, had done an enormous amount of work with excellent results, and gave over all its arrangements in an advanced state. These officials had moreover, been able to carry the people with them, and in a considerable degree had obtained their help and confidence ; so that the inhabitants, who had come to realize to some extent the value of the Government measures, were prepared for the more rigorous and better organized arrangements of the Plague Committee. The great advantage possessed by the latter was undoubtedly the power given to them in having the troops at their disposal for the thorough searching of houses and for other duties.

On the 6th August the Permanent Medical Board declared the plague to be no longer epidemic in the town and port. On the same date the last case was discharged from hospital ; and from the 16th August the place was pronounced free from infection under the terms of the Venice Sanitary Convention.

The spread of Plague from Karachi into the Province of Sind is shown in Statement No. II, which is based upon reports received in my office. It may possibly not include a few smaller localities which became infected. Tando Allahyar, on the Hyderabad-Umarkot Railway, in the Hyderabad Collectorate, had the first local case on the 15th January. The towns of Sukkur and Hyderabad became locally infected on the 12th and 28th February, and the village of Jungshahi on the 22nd February. From March 11th local cases occurred in the town of Shikarpur, and during the last week of March in Tatta and Kotri. On the 22nd March a local case was reported from Jacobabad, but it is said to be doubtful whether it was plague. It was not followed by others. During the second week of April the plague became severely epidemic in several villages in Rohri Taluka ; but after this period there were no other local outbreaks of importance, except in the town of Rohri, in which local cases are said to have first appeared on April 6th though infection occurred eight weeks previously.

The longest interval between the first importation and local infection occurred at Tatta, *viz.*, from 17th December 1896 to 23rd March 1897. This fact speaks well for the thoroughness of the earlier measures taken at that place for keeping out the disease, especially when it is

remembered that eighteen out of the thirty-four imported cases arrived during December and January. It is to be regretted that at Sukkur definite information of imported cases is wanting. The Civil Surgeon reports that the earliest supposed imported case of plague was that of the son of a Bunniah, who died suddenly "about the first week in February." The Bunniah had previously received a consignment of dried fruits, pepper, &c., from Karachi; and the Civil Surgeon supposes that infection was conveyed by these, and states that no personal communication between this family and Karachi could be traced. The nature of this supposed case (though not improbably plague) has not been verified, and, bearing in mind the known interval of several weeks which is shown to have elapsed in other places between importation and local infection, it seems probable that imported cases had occurred in Sukkur long before the first week in February, seeing that the first recorded local case occurred on the 12th of that month.

At Rohri also very suspicious deaths, undoubtedly due to plague, in a family which arrived from Sukkur in the second or third week in February, were reported by the Hospital Assistant to be due to ordinary fever; and the disease became established in the place owing to want of early preventive measures. The Hospital Assistant, having suspicions, asked the Civil Surgeon to see the body of the last of these fatal cases. That officer, however, could not go, and the Hospital Assistant took no action.

The total number of cases of plague reported to me by Medical Officers and Assistants from outside Karachi was 1,512; of these, 235 were recorded as imported, nearly half being arrivals from Karachi. Sukkur and Hyderabad were the other two great centres of diffusion; but the number of importations reported to me from the latter place was comparatively small. To what extent cases of plague occurred which were reported to the Deputy Sanitary Commissioner, and not to me, I cannot say.

The escape of some places, such as Sehwan, Hala, Mirpur Khas, Ghotki, Larkhana and Jacobabad, from local infection is interesting; and it may be noted that all these places, except Hala, are railway stations and have much intercourse with other parts of Sind. Jacobabad has a Civil Surgeon, Sehwan a qualified Medical Officer, and at the others Hospital Assistants are in charge of the dispensaries. Other

towns which became infected, such as Tatta, Kotri, Tando Alahyar and Shikarpur, in which severe outbreaks might have been expected, escaped with a very small number of local cases, though the number of those imported was considerable. At Tatta only 17 out of 51, and at Shikarpur only 4 out of 32 cases were local. Such results speak well for the management of the local authorities and the Medical Officers. Knowing well the crowded and insanitary state of this town, I feared the epidemic, when once established there, would be severe. This contrast between severity and mildness of incidence does not appear to have been due to any differences in sanitary or other permanent conditions. Certainly the populations of Hyderabad and Sukkur are larger than those of the other towns named, but that of Shikarpur is considerably greater than that of Sukkur.

As regards proximity to Karachi, the towns of Tatta, Kotri and Sehwan are well situated for infection; whilst Shikarpur and Larkhana would seem, as regards position, just as liable to become infected as Sukkur. It seems probable, therefore, that the immunity, whether complete or comparative, of certain places was due to the character of the measures adopted, and especially to the thoroughness and intelligence with which they were carried out by the individual officials concerned.

Hyderabad seems to have become infected almost in spite of precautionary measures, which, I believe, were thorough and well carried out. But there, as in other places, during the early weeks of the epidemic detention of arrivals was not at first enforced. This measure is, in India, absolutely essential and would have greatly mitigated the spread of the disease.

Sukkur had in every way the advantage of position, and the severity of the plague in that town and in Rohri and adjacent villages would seem to have been due to some defect in the arrangements. In Sukkur and Hyderabad the maximum intensity occurred during the second week in April, that is to say, when the hot dry season had well begun. In neither of these large towns, therefore, can it be said that the onset of hot weather arrested the plague, the progress of which seemed to depend upon the management of the epidemic. I attribute the decline rather to the sanitary and police measures adopted than to climatic changes, and believe that the influence of the latter on the spread of plague is restricted to the effect of warmth and dryness in diminishing overcrowding in houses and in favouring cleanliness. There seems no

reason to suppose that, given the present sanitary conditions, Plague may not originate and, if uncontrolled, spread in India at any season of the year, though certain climatic conditions may be more favourable than others to its development.

At Sukkur, which was not locally infected until 12th February, and which therefore had ample time for preparations, no imported cases were discovered until some days after their occurrence, and none were then officially recorded. It is probable that there were many such (and perhaps other local ones) prior to the date abovenamed. The Civil Surgeon cites two deaths which occurred during the first week in February as cases of importation. That of the Bratmin's wife who died "immediately after arrival and very suddenly" does seem to have been of this kind. But in the other instance no evidence of personal importation is forthcoming, and the Plague is assumed to have been conveyed to the Bunniah's son through the medium of infected groceries or sacks. It appears to me difficult to accept this view, and to be more probable that human importation (which is denied), or infection by rats, was the origin of the case. During the week ending 5th April 105 fresh cases are said to have been reported; but of these only 15 and 2 corpses were found by search parties, which are reported to have been in "full swing" at the time. More reliance was placed at first upon informers than on systematic searching. Concealment certainly seems to have been most persistently carried on; and, as a consequence, a very large proportion of cases were not made known until after death. During the first week in April health camps, disinfection of clothing and other measures were being organized in this town.

Tatta, a town very early, and more than once, infected, and liable to a severe epidemic, was well defended by the measures promptly adopted. At Jungshahi, Sehwan, Dadu, Tando Allahyar, Larkhana and Jacobabad, isolation and segregation proved entirely effectual in preventing the diffusion of the plague which entered those places.

INSPECTION OF RAILWAY PASSENGERS.

On the 14th December 1896 orders were issued from my office, as a routine arrangement under the Railway Act, for the inspection by a Hospital Assistant and the Railway Apothecary of all passengers leaving Karachi from the City and Cantonment stations and for the detention of those ill with fever. Arrangements were at the same time

made for the assistance of the Police and Railway officials. The inspections here were actually begun on December 13th. At Shikarpur, Jacobabad and Sukkur the Civil Surgeons, on their own responsibility, began to examine passengers by the up trains from the 22nd, 26th and 30th December. Passengers were also examined by Hospital Assistants at seventeen smaller stations.

On January 1st 1897, under instructions from the Director General of Railways, I issued orders for similar inspections of up passengers at seventeen other stations on the North-Western Railway in this Province where Medical Officers or Hospital Assistants (in charge of railway dispensaries) were stationed. I also ordered the Hospital Assistants in charge of grant-in-aid and municipal dispensaries on the railway line to examine the passengers alighting at their stations; and on the 7th January, at the request of the Collector at Karachi, I posted a Hospital Assistant at Jungshahi Railway Station to examine passengers alighting there on their way to the town of Tatta.

These arrangements, with certain modifications, were continued until the close of the epidemic. Under Government orders the inspections at important stations were supervised from 7th February 1897 by Commissioned Medical Officers, and carried out on the station platforms with certain precautions to prevent evasion.

The platform inspections under this system ceased on the following dates :—

At Karachi on the 21st May.

At Dadu on the 5th May.

At Hyderabad on the 5th June.

At first passengers by up trains only were examined. But it was afterwards found necessary, in order to protect Baluchistan and places in Sind (including Karachi itself) from persons fleeing southwards from infected parts of Sind, to examine those by down trains also at the following places :—

| | | |
|----------|--|------------|
| Rohri. | | Jacobabad. |
| Sukkur. | | Shikarpur. |
| Karachi. | | |

As regards the result of railway inspections, Statement No. IV shows that of 732 passengers removed from trains by Inspecting Medical Officers, only 51 were afterwards found to be actually stricken. It is true

that the inspections may have been useful in preventing some persons from travelling. I do not think, however, that their effect in this direction can be demonstrated; and, on the other hand, there is no question that they had the disadvantage of inducing plague-infected persons to travel on bye-ways, and thus tended to favour evasion of discovery and perhaps to diffuse the disease. The natural effect of a railway would be to drop cases along the line; the inspections rather tended to scatter them. That inspections are essential at frontier and certain other stations I do not doubt, but they should not be too numerous. The figures above given prove, I think, my contention, urged when inspections were first established, that they are but a very imperfect mode of arresting the spread of the disease. This is due to the fact that, on short journeys, plague-stricken persons can pass one or more inspection stations during the incubation stage.

The following figures support this view. At the undermentioned places :—

From Karachi.

| | |
|-----------------------------------|---------------------------|
| Jungshahi | 2 hours by rail, |
| Tatta (<i>via</i> Jungshahi) ... | 5 hours by rail and road, |
| Hyderabad... .. | 5 hours by rail, |

there were in all 87 cases of plague known to be imported from Karachi, and which are known, or may safely be assumed, to have travelled by the direct routes above given. In 74 of these the dates of arrival are recorded, and we find that there were—

| | Cases. |
|---|--------|
| Ill on day of arrival | 16 |
| Attacked on 1st day after date of arrival | 18 |
| „ 2nd „ „ | 9 |
| „ 3rd „ „ | 10 |
| „ 4th „ „ | 9 |
| „ 5th to 8th „ „ | 11 |
| „ later than 8th „ „ | 1 |
| | — |
| Total | 74 |
| | — |

These 74 persons passed one inspection at Karachi, a second at either Jungshahi or Kotri, and some (35 cases) even a third at Hyderabad. Yet we find that 34 of them—nearly half—were

ill with plague within about 48 hours, and 53 within about 72 hours, of their latest examination, at which their illness had not been developed or, being then slight, had escaped detection. It is true that 14 persons from Karachi were taken out of trains at Kotri (4 hours' journey) suffering from plague, and that 9 were stopped at Dadu and 18 at other stations; but this small number of developed cases discovered, though not unimportant, cannot be set against the figures given above and the unknown cases which must have escaped detection after passing the examinations. I would especially note also the small number detained at Karachi, on suspicion, from among up passengers, and the very small proportion of these who became ill with plague.

It seems to me therefore that, though not absolutely useless, these inspections on railways fail, because of the rapidity of the journeys, and because it is possible for a passenger feeling ill to alight before arrival at an inspection station, or, as often happened here, to travel by road to a wayside station beyond the inspection and take train thence to a similar one on the near side of the next inspection station. Attempts were made by passengers from infected places to evade the extra care with which such were examined, by taking a fresh ticket at an intermediate station. Persons would even travel beyond the inspecting station, and return thence to their destination. I therefore submit that my opinion, officially expressed quite early in the epidemic, that railway inspections were of comparatively little value, is supported by the above figures and reasons. The results have not been in any degree commensurate with the cost, and the plague spread in spite of them.

As regards inspection stations, Statement No. IV shows that the most efficient work is done at those which are not too near the main centres of diffusion of the plague. For the protection of a country they are suitable only at frontier stations or at considerable intervals on long distance journeys. They may also be to some extent serviceable, at the commencement of an outbreak, to prevent a certain proportion of sick from escaping from the centre of diffusion. The only efficient mode of limiting the spread of plague from one place to another is systematic detention, for a certain period, of all arrivals from infected places; and this should, if possible, be supplemented by restrictions on travelling. Registration and notification of arrivals and departures from infected places would in India be impracticable

on a large scale ; and even, if possible, would not, owing to the absence of the controlling staff, yield the desired results.

The records of the Health Officer of the Port give similar testimony to the inadequacy of mere inspection. In 42 vessels from Bombay and intermediate ports entering harbour between 1st November 1896 and 31st July 1897, and carrying 6,697 passengers, only 2 persons were found on inspection to be suffering from plague. But, on the other hand, out of 4,929 passengers by these vessels who were detained in quarantine or under observation, 13 subsequently developed plague. The latter number is not large, but is sufficient to demonstrate the superiority of, and even the necessity for, detention of passengers from infected localities or ships.

Among 19,623 outgoing passengers, 11 cases of plague were discovered previous to embarkation. Fifty others were detained under observation and, of these, 13 developed plague. Of course, the outgoing passengers from Karachi would include a larger proportion of persons who had been recently exposed to the risk of infection than did those arriving, who were gathered from a wider area. In reference to inspections see also under the heading of "The Period of Incubation in Plague."

DIFFUSION AND INFECTION.

The slowness of diffusion of plague has already been alluded to. So far as recent experience has shown, an epidemic of plague spreads with deliberate and definitely-timed steps. The establishment of each new focus of infection results from the movements of infected persons. But the origin and date of appearance of local cases which, if not prevented by Police measures, will follow after what appears to be a definite interval of about one month, seem to be determined by conditions yet unknown. When once locally established, however, the infection may spread with a rapidity which contrasts in a marked way with its hitherto tardy advance.

This leads to the inference that the bacilli do not infect until they have gained a certain degree of potency, and that they require certain media for their development. How infection takes place cannot at present, so far as I am aware, be demonstrated with certainty. It is known, however, that the infection (*a*) will prevail in certain dwellings

and amongst certain families, whilst others in the immediate vicinity will escape ; (b) that the spread of plague is associated with, or favoured by, overcrowding, dirt, and other insanitary conditions ; (c) that contact with, or contiguity to, persons suffering with plague will, under certain conditions not exactly known, result in infection—probably the duration of the required exposure is proportionate to the numbers of the required microbes and to the resisting power of the individual ; (d) :that possibly plague may be communicated by infected clothing and other articles.

The instances in which the plague has affected whole households, and has followed within a week or ten days after contact with infected persons,—one after another of a family having often succumbed,—are so numerous that I am unable to avoid the conclusion that infection occurs by inhaling the microbes when in close proximity to the sufferer, or in any place the air of which contains them in certain numbers. It is scarcely possible that, during an epidemic, the germs are entirely absent from all dwellings in which cases of plague do not occur. In such localities, if present, they do not produce results, either because their potency is impaired by the presence of a sufficiency of fresh air, light and cleanliness ; or because the inhabitants, under these favourable conditions, possess a certain power of resistance to infection. In a plague hospital, for instance, though the microbes, even with the best management, must be present in the air of the wards, yet the attendants rarely become infected. In this respect plague differs from typhus ; for we know that non-immunised persons are extremely liable to take the latter, even though attending the sick in the best surroundings. The plague bacillus appears then to be not very readily diffused in pure air and cleanly environments, or to be more easily killed in air than that of typhus—the existence of which I will assume.

That infection by the air passages does occur appears to be shown by the occurrence of cases of primary plague pneumonia. This special form of the disease in which the lymphatics are not obviously involved may depend on the accident of the direct entry of the germs into the blood stream. That a general affection of the lymphatic glands cannot result from pulmonary infection does not seem probable.

Cutaneous inoculation has recently been maintained to be the most usual mode of infection. But, though it may occasionally happen

its general occurrence would seem improbable; and to the reasons just given, the following may be added in support of this opinion:—

(1) It is difficult to believe that any large proportion of the inhabitants habitually have lesions of the skin—even though minute ones suffice—suitable for the absorption of the infection.

(2) We know that in septicæmias and other external infections, a decided lesion is required, and that, even though this be present, infection does not always occur. It seems very improbable that, in any large proportion of those having the smallest lesions, it would chance that these should become infected.

(3) Were inoculation by very slight cutaneous lesions the usual mode of infection, the plague would be even more destructive than it is.

(4) When once established in a place, the disease has spread more rapidly than if it were diffused mainly by external inoculation.

The potency of the latter to cause an epidemic quickly spreading among people of various castes, of entirely different habits, and socially separated from each other in every way, involves the supposition of many contemporaneous foci, the existence of which, at the beginning of an epidemic at least, has not been found to be usual.

(5) The rarity of the occurrence of plague among those of the upper classes of natives who live in houses of a superior class, and who do not ordinarily frequent insanitary places, yet whose habits as regards the infrequent use of shoes, and in certain other ways, resemble those of the poorer classes.

(6) The public latrines of infected quarters must be regarded as probably fertile sources of infection, in whatever mode it takes place. In fact, no other probable source of infection (short of contact with a patient or infected room), which could spread the plague as rapidly as it did spread, occurs to me. But though men might commonly have become infected in these places, most women attacked did not use them.

(7) The women's duties as attendants on the sick must, however, have exposed them to the dangers of cutaneous inoculation far more than the men; yet they were attacked in nearly equal numbers. For of those attacked in Karachi between the ages of 20 and 55, one in

every 21·5 of the population were men and one in every 23·5 were women. In the whole province, the attacks per mille of population among males were 11·0 as compared with 5·3 among females. Presuming external inoculation to be the rule, it therefore appears that it is not more frequent among women who tend and handle those sick with plague than among men who do less of these duties, which is scarcely credible.

(8) The rarity of local signs of inoculation.

(9) The still greater infrequency of inoculation among the staff and attendants in a plague hospital. Were external inoculation the common mode of infection, it would be reasonable to think that, in Indian hospitals at least, the paid attendants and, even more commonly, the relatives of patients would, owing to their ingrained disregard of precautions, have frequently succumbed.

This immunity appears to prove the truth of aërial infection, and to seriously weaken any evidence which exists in favour of external inoculation. For whilst the conditions favouring the one are, in a hospital, very greatly diminished, those conducing to the other continue to exist for all alike with but slightly diminished strength.

(10) The occurrence of infection by way of the lungs is acknowledged by the supporters of external inoculation; and the possibility of the former being granted, it seems somewhat unreasonable, looking at the greater facility with which it would occur, to question its universality. It may be conceded that pulmonary inoculation does cause, in certain instances, a special type of the disease, the chief feature of which is primary pneumonia. But it would seem that it has yet to be proved that the ordinary form of the disease is not commonly conveyed through the lungs.

(11) The analogies of other contagions do not seem to favour the external inoculation theory. In none of the other specific fevers does this normally occur; whereas in those diseases in which it is possible or usual, local manifestations of infection are the rule (tubercle, leprosy, syphilis, septicæmia, anthrax, diphtheria), or they are entirely absent (tetanus, hydrophobia). But, in their general characters, the infections above-named differ entirely from those eruptive fevers (typhus, relapsing fever, or mumps) which plague most resembles; and there is no reason to believe that, in any of the latter, infection takes place by external inoculation.

In mumps one special gland becomes inflamed, yet it can scarcely be argued that this is due to external inoculation. Why, in a similar manner, should not the whole lymphatic system be affected in plague through pulmonary inoculation?

(12) The rapidity with which plague spreads among families and among occupants of the same dwelling seems to support causation by aërial infection.

In 277 instances (representing more than 554 persons) in which more than one attack occurred on the same day as others in the same family or dwelling, or followed a previous case within 10 days, I find that the intervals between attack and such preceding case were as follows:—

| Interval. | | | | | | | | Cases. |
|---|------------|-----|-----|-----|-----|-----|-----|--------|
| Attacked on the same day as previous case | | | | | | | | 122 |
| 1 | day after | ... | ... | ... | ... | ... | ... | 58 |
| 2 | days after | ... | ... | ... | ... | ... | ... | 34 |
| 3 | do. | ... | ... | ... | ... | ... | ... | 18 |
| 4 | do. | ... | ... | ... | ... | ... | ... | 16 |
| 5 | do. | ... | ... | ... | ... | ... | ... | 8 |
| 6 | do. | ... | ... | ... | ... | ... | ... | 4 |
| 7 | do. | ... | ... | ... | ... | ... | ... | 3 |
| 8 | do. | ... | ... | ... | ... | ... | ... | 8 |
| 9 | do. | ... | ... | ... | ... | ... | ... | 4 |
| 10 | do. | ... | ... | ... | ... | ... | ... | 2 |
| | | | | | | | | 277 |

I have been unable to ascertain all the instances of multiple attacks in single households; but the above figures show, if it were necessary to demonstrate that which is well known, how often two or more persons in the same house were attacked with plague simultaneously or within a few hours of each other. Were external inoculation the usual mode of infection, it seems very improbable that the coincidence of the time of exposure of cutaneous lesions to infection would occur in so large a proportion of cases as is above indicated. Whereas these are easily explained by the theory of pulmonary infection, to which all those inhaling plague-poisoned air are exposed from the first moment of its inspiration.

RATS AND THE PLAGUE.

The manner in which plague spreads from place to place seems to favour the notion that rats play an important part in its dissemination. But I can produce very little useful evidence on the subject. In Karachi and elsewhere they certainly died in large numbers in the affected quarters, and the following cases bearing on this question have been reported to me :—

The Medical Officer, Kotri Dispensary, mentions the case of one infected house where a few rats were found dead.

The Civil Surgeon, Sukkur, states that on the outbreak of plague in that town, dead rats were for the first time found in the shops of fruit vendors who brought their supplies of groceries and dried fruits from Narrayendas, a Buniah, who imported them from Karachi and whose son died suddenly during the first week in February. This, though not officially reported at the time, was probably the first or one of the first imported cases in Sukkur. The Civil Surgeon also reports that a Sanitary Inspector in Sukkur saw rats die suddenly whilst drinking from a drain by a grain warehouse close to a temple where several cases of plague occurred, and that from an infected temple at Sukkur 35 dead rats were removed on the 11th April.

At Karachi, a boy aged 15 years, living in the North-Western Railway Native Staff Lines, who was attacked with plague on the 10th April, was reported to have been playing with a dead rat three days previously. There had been no human case of plague in the lines since the 26th March, an interval of fourteen days.

Assistant Surgeon E. Mackenzie reports that three inmates of one house at Manora had visited Karachi and attended funerals contrary to advice. He suggests that they carried the poison on their feet to Manora and thus infected the rats, four of these animals being afterwards found dead in the house. A week later (3rd and 4th April) the three men were attacked with plague.

A sweeper of the 1st Wiltshire Regiment living in lines near the Napier Barracks, and half a mile away from any infected dwellings, was found dead in his quarters from plague on the 14th March, with a dead rat lying near him. He had been taken ill four or five days previously,

and had gone away to live in some huts outside cantonment limits. Becoming worse, he returned to his quarters on the 13th March, having apparently been driven away by his friends in the huts. Now it does not seem probable that the rat had become infected by the man during his early incubation period; nor, as I believe, could infection and death of the rat have occurred in the short time which elapsed between the 13th and 14th March. One of two conclusions must therefore be drawn, *viz.*, (1) that the infection was brought to the sweepers' lines by rats a few days prior to the 10th March (the approximate date of the man's attack), or (2) that both man and rat were infected at about the same time by food or other substance brought by the former. There were many rats in holes in the floors of some of these quarters. The occupants were all removed into tents on the 15th March, and only three more cases occurred among those people—all on 21st and 23rd March.

The Civil Surgeon of Hyderabad says that the inhabitants of that town considered themselves safe until dead or dying rats were reported in their neighbourhood. This was the signal for residents to leave not only single houses but streets and quarters.

That rats play an active part in carrying the plague from one part of a town to another would seem fairly certain; but that they commonly infect human beings, however probable, seems to require proof, though the case of the boy just mentioned seems to strongly support this view. Colonies of rats in dwellings would certainly appear to be a source of danger, and their liability to plague indicates the importance of destroying them and of stopping and disinfecting their holes. It seems probable that concealed cases may continue to occur among rats after an epidemic has disappeared, under preventive measures, from among human beings. This indicates the necessity for keeping a watch upon them, not only during, but after an epidemic.

THE PERIOD OF INCUBATION IN PLAGUE.

The accompanying chart refers to figures already quoted under the head of "Railway Inspections," and shows the intervals between arrival at certain places and dates of attack of all the imported cases in Sind regarding which I have information. They are 235 in number, and

in 213 of these the dates of arrival were recorded. The intervals in the latter were as follows :—

| | | | | | | Cases. |
|---|-----------------------|-----|----------|-----|-----|-----------------|
| Arrived ill or dead | ... | ... | ... | ... | ... | 32 |
| Attacked within 2 days of arrival | ... | ... | ... | ... | ... | 100 |
| Attacked on the 2nd, 3rd, and 4th days after arrival. | | | | | | 62 |
| Do. | 5th day after arrival | ... | ... | ... | ... | 6 |
| Do. | 6th do. | do. | ... | ... | ... | 4 |
| Do. | 7th do. | do. | ... | ... | ... | 5 |
| Do. | 8th do. | do. | ... | ... | ... | 2 |
| Do. | 9th do. | do. | or after | ... | ... | 2 |
| | | | | | | <hr/> 213 <hr/> |

It may reasonably be assumed that these persons were exposed to infection within a day or two prior to departure ; that, in fact, they left their dwellings in the belief that they had been exposed to infection. The period of incubation may therefore be reckoned as commencing from one to four days earlier than the dates of departure, which would make its maximum length from two to eight days, or perhaps a little longer. My opinion is that, as indicated by the above figures, Plague almost invariably declares itself by symptoms within the fourth or fifth day from infection. It will be noted that only four cases are recorded in which the interval between arrival and attack was more than seven days. Of those in which the interval was over five days, it is possible that some at least were infected on the journey or after arrival at destination.

The rapidity of invasion and development of the disease is illustrated by the considerable number of persons who arrived ill or dead at places within a few hours' journey from Karachi, or who were attacked within twenty-four hours after arrival at their destinations.

The general uniformity of the figures in this statement is worth noting. All the places give similar records in support of a short period of incubation, and of the fact that plague-stricken persons can travel for a certain distance without showing obvious signs of illness.

The following histories bearing upon the incubation period, and showing the rapidity of onset and how natives stricken by Plague will travel up to the moment of their attack or even of death, may be of

interest. It will be seen that of the nine people who travelled in the early stage of illness, six recovered and three died. Although two of these persons escaped detention, yet it must be acknowledged that the discovery of seven out of the nine who travelled by railway illustrates the value of railway inspections in stopping a certain proportion of cases.

(1) Saijoo Jamnadass arrived on the 19th March at the Karachi Cantonment Station by the No. 7 up mail from the harbour, where he had just landed from Malta *via* Bombay. Having a temperature of 103.6° , he was detained by the Inspecting Medical Officer and sent to the Plague hospital observation sheds, whence he was discharged on the 21st March. On the same evening he passed the railway inspection with a normal temperature. He then went to Hyderabad, where he remained three days, and thence to Rohri, where he stayed one day. At Ghotki, about sixty miles beyond Rohri, he was taken out of the train ill with Plague, having a ticket to Multan. He had a bubo and was seriously ill, but his adventures were compensated by recovery. He seems to have been infected in Hyderabad, and the incubation period to have been under five days.

(2) Khemo Homdoo, with a ticket from Kotri Bandar to Agra, arrived at Ghotki on the 6th April, and was removed from the train ill with fever, which on the 8th was diagnosed as Plague. He recovered.

(3) Prem, son of Phatan, who had absconded from the railway lines observation camp at Karachi, was stopped by the medical officer at Sehwan on 24th February under telegraphic instructions. He died on the same day.

(4) Kaliani left Hyderabad on 3rd April, stayed in Kotri four days and left that place on the 7th by the Quetta mail with a ticket for Laki. Thence she returned by rail to Sehwan, where she was found ill and segregated on the 8th April. She recovered.

(5) Changu Patan left Karachi on February 19th and arrived well at Sehwan on the 20th. He was taken ill the same day whilst on the road to his home and was seen on the 21st a few hours before death at the village of Bagar, 12 miles from Sehwan, by the Medical Officer of the dispensary.

(6) Mitta Bhaga arrived at Dadu by rail from Karachi on 7th March with ulceration of femoral glands. He had been attacked on the 25th February with an illness which was evidently Plague, a case of which had died in the house adjoining his. This case shows how the Plague may possibly be conveyed by patients during early convalescence.

(7) Tejoo Tahlilio was attacked with Plague in Karachi on 8th March. On the 10th he travelled by camel to Malir (14 miles) where he took train to Bhan. Thence he went by road to Johi near Sehwan. He was brought into the latter place for treatment and recovered.

(8) Multani Syce, in the service of medical officer, who left Karachi Cantonment with his master on the night of 25th March, was found at Dadu on the morning of the 26th to have the Plague. He had lived in Karachi Cantonments in a compound where the sweeper's son had died of plague six days previously. This man recovered.

(9) Pirimal arrived at Kotri ill with Plague on April 9th and was discovered on the station platform. He said he had come by train from Dhabeji, to which place he had travelled 30 miles by road from his village of Buhara. It could not be discovered that he had been to Karachi, and the source of his infection is unknown. He recovered.

(10) Bhagul, wife of Rujub, crossed the Indus on the 21st April from Hyderabad to Kotri to visit a shrine near the latter place. On the next day whilst returning she was found on the roadside ill with Plague. She died on the ninth day.

(11) Case No. 32 at Manora was delivered at full term on May 4th, was attacked with Plague on May 8th and isolated. Her sister used to visit her from Karachi during the lying-in and helped to wash her. Possibly infected her vaginam. Incubation period under eight days.

(12) Case No. 33 at Manora. A Christian cook, living close to the above. Said to have had an abrasion on left foot. Attacked on May 10th; left femoral and popliteal buboes. Incubation period under ten days, probably three days.

(13) Case No. 40 at Manora. A European child, living close to the above; attacked on 14th May. Incubation period not more than six days, probably four days. She had an abrasion on the dorsum of right foot and right inguinal bubo. The case was seen by me. No

other cases occurred in the neighbourhood of these; and it seems most probable that in some way No. (12) was infected from No. (11), and No. (13) from No. (12), or possibly from No. (11). The premises in which they occurred were contiguous.

Surgeon-Lieutenant Niblock cites the following case :—

(14) On February 1st, a constable was admitted into the police ward of the Civil Hospital for fever, which on February 4th proved to be Plague, and ended fatally on the same night. In the ward was another constable admitted on January 12th for phthisis. He was attacked with Plague on February 6th, five days after admission of the other man, and died in a few hours. This happened a few days before the removal of ordinary patients had been completed.

At Tatta the following cases in which the incubation periods were said to have been prolonged came under notice :—

(1) Shewee, who was attacked on the 11th January, was reported to have arrived from Karachi three weeks previously.

I enquired very carefully into the case and was assured by both the Assistant Collector and the Assistant Surgeon that the time of her arrival was approximately correct, and that they were satisfied that she had not since communicated with Karachi or been in contact with other cases in Tatta. But, on putting a series of questions, I learnt that, three or four days before she became ill, her husband and son had arrived from Karachi. I ascertained by enquiry that their house in Karachi was free from Plague; but they acknowledged that between 8 and 12 days prior to their leaving here, that is within seven days of the woman's illness, they had attended four funerals of persons who died of Plague in houses adjacent to theirs. Both the husband and son remained well; but I nevertheless think it probable that they communicated the Plague to their relation. It seems very unlikely that Shewee was infected from local sources; for her house was at the outskirts of the town, and this was negatived after full official enquiry.

(2) Bhiroo arrived in Tatta from an infected part of Karachi on the 24th January *via* Jhimpir, and was attacked on the 12th February. I found on enquiry that during this interval the man had gone to Karachi to fetch his daughter, and had slipped back into Tatta unknown to the authorities.

Neither of these cases can therefore be accepted as instances of prolonged incubation of Plague. In fact they tend to prove that it is less than ten days.

SEGREGATION.

The first trial of segregation on a large scale was made in Karachi at the Nussurpuri camp. Early in January I had suggested this measure verbally to the Municipal Health Officer as one for general application and within a few days steps were taken to carry it out. I had no part in the arrangements and do not know whether they originated with my suggestion or from another source. The Nussurpuri camp was success in all important respects but one ; up to the end of March the occupants' movements were imperfectly controlled, and there was therefore no segregation in its true sense. From the 22nd January, when the camp was first occupied, up to the 31st March when the epidemic ceased among its occupants, there were 83 cases of Plague among them. During the first three days no attacks were recorded. From the 26th January they were as under, the figures being kindly furnished by the Municipal Secretary :—

| | | | | | Attacks. |
|--------------------------|-----|-----|-----|----|----------|
| 23rd to 25th January | ... | ... | ... | 0 | |
| Week ending 1st February | ... | ... | ... | 21 | |
| " " 8th | " | ... | ... | 21 | |
| " " 15th | " | ... | ... | 9 | |
| " " 22nd | " | ... | ... | 8 | |
| " " 29th | " | ... | ... | 2 | |
| " " 7th March | ... | ... | ... | 5 | |
| " " 14th | " | ... | ... | 9 | |
| " " 21st | " | ... | ... | 4 | |
| " " 28th | " | ... | ... | 2 | |
| From 29th to 31st | " | ... | ... | 2 | |
| Total | | | | | 83 |

Forty-two—that is just half—of the cases occurred, therefore, within the first seventeen days from removal. The absence of attacks during the first three days (four days including that of removal) is explained by the average incubation period. From the fifth day fresh cases appeared, doubtless infected before leaving their homes. These gave rise to other cases up to the 8th February, when there was a lull in the epidemic, due to destruction of infected huts and removal of the occupants into others. There was then an interval of four days

followed by another outbreak, possibly due to infection from previous cases in camp. After February 16th there was a more permanent decline, and the restored confidence no doubt led, under an absence of segregation, to several re-infections from the town which caused the subsequent attacks.

In reporting to Government (8th March) on the persistence of attacks in the camp, I stated that in my opinion re-infection had occurred from without, quoting the cases of four men who had been going to and fro between the camp and an infected part of the town where they followed their usual avocations. I also pointed out that residents in the camp constantly entered the town for marketing ; and stated that I did not, on the ground of persistence of attacks, condemn the camp in principle. I opposed the return of the occupants to the city, which had been partially conceded, observing that, notwithstanding the rather numerous Plague cases, the people were not only safer from Plague, but healthier in other respects, than if they were in their houses ; that, with supervision and certain restrictions, further infection from outside might be minimised, and any fresh cases which occurred in the camp could be promptly and easily dealt with.

On the 9th March I wrote that I could not say exactly how many cases of Plague occurred in the camp which were not infected direct from the city, but cited eight which had probably originated in the camp. In conclusion, I stated my belief that, although several cases of direct infection from the town had occurred, many had originated in the camp from intercommunication among its occupants ; also that it was possible for visitors, who obtained admission to the camp, to have brought the disease with them. I am still of the same opinion ; though, with regard to importation by outsiders, I do not think its occurrence very probable.

The arrangements for the notification and isolation of Plague cases in the camp were very defective. I think they might have been better though I am aware that the people were induced, after much opposition, to leave the city under promises of specially considerate treatment, and that they were particularly conservative and difficult to deal with. The Hospital Assistant attached to the camp, which I frequently visited, did what he could, with the help of an Inspector, to discover the sick ; but there was much concealment and great opposition to treatment. Only a small number of those attacked were removed to the hospital sheds, and few of these consented to use internal remedies.

Notwithstanding the occurrence of a considerable number of Plague cases, I hold very strongly that the Nussurpuri Camp was, on the whole, a decided success. I have shown that 59 of the 83 attacks were during the first four weeks of the occupation and have explained how, in my opinion, they were caused. I believe that if isolation had been enforced from the first, many of the attacks subsequent to January 26th would have been prevented ; for the figures show that even with no repressive measures of importance, beyond burning of infected huts and clothing, the epidemic in its severe form soon died out, and was followed, in the remaining six weeks, by a series of twenty-four cases, several of which may reasonably be assumed to have originated by infection from outside. In other words, the mere removal of these people to a healthy place and wholesome environments sufficed, with imperfect measures of sanitary police, to stay an epidemic, which would almost certainly have been extremely severe had they remained in their very unhealthy and overcrowded houses.

In the Karachi Cantonment segregation was successful in each of three camps :—

(1) On March 14th a sweeper of the 1st Wiltshire Regiment died of Plague in his quarters. On the following day the occupants (125 persons) of the Sweepers' Lines were removed into tents near the lines. Only three more cases occurred, the last on March 23rd. These people re-occupied their lines on July 27th.

(2) From March 23rd to April 1st inclusive, 11 cases of Plague occurred among the syces and other native establishment of the 53rd Field Battery, Royal Artillery. On the 2nd April these people, numbering 374, were transferred to tents near their huts. Between this date and May 9th there only were 10 attacks among them, and of this number 6 happened between April 2nd and 6th inclusive, that is, within four days from segregation. The remaining 4 were no doubt due to unauthorized communication with the town.

(3) The Followers' Segregation Camp and Isolation Hospital in charge of Surgeon-Major R. J. Geddes, A.M.S., Staff Surgeon, were opened on March 23rd. In the former 315 persons were detained, and among these only five were attacked, viz.,—

| | | | | | No. |
|---------------------|-----|-----|-----|-----|-----|
| After 1 day in camp | ... | ... | ... | ... | 1 |
| „ 2 days „ | ... | ... | ... | ... | 2 |
| „ 5 „ „ | ... | ... | ... | ... | 1 |
| „ 6 „ „ | ... | ... | ... | ... | 1 |

Those removed to this camp came at intervals in small batches from infected and suspected houses in various parts of Cantonments, but most were from the Commissariat Transport Lines. Each occupant, with clothes and bedding, was disinfected on admission and detained for ten days. This camp, which was kept open until May 20th, was therefore, like all others which were properly managed, an undoubted success.

The only other instance of segregation in Karachi which came under my cognizance was in the Railway Lines with a population of about 1,500 persons, mostly living in well built lines. Infection here began from the Bunniah's shop, all the six occupants of which were attacked between the 15th and 23rd February. Between the 24th February and 13th March seven other cases, which apparently had the same origin, occurred. These were followed by single attacks on the 26th March and 10th April, the first that of a drunkard, who constantly visited the town, and the other in a boy who played with a dead rat three days previously.

A native fireman, living in the Karachi Railway Lines, who arrived ill at Kotri on the 21st February, was included in the return of the Medical Officer of the latter station, but may here be added to the above. The attacks were therefore only 16 in number, and it may safely be said that this was due to the immediate isolation of the sick, the segregation of the healthy from the infected and contiguous huts, and the destruction of infected dwellings and materials. Only two of the 16 were attacked in the segregation camp and this within a week of their removal; these (from the Bunniah's shop) ran away, but were stopped at Sehwan and Dhabeji Railway Stations, where they died.

I am informed that at Manora and Keamari segregation was equally effectual. At Manora no cases of plague originated in the camp. At Keamari there was an instance in which a large body of people who had suffered severely were removed *en masse* from their infected huts to others built on a fresh site, with the result that only one subsequent attack occurred.

As regards out-stations, the reports of all officers and subordinates are in favour of isolation of the sick and segregation of persons probably infected, which measures appear to be very properly accepted as certain to arrest the spread of plague. The arrangements at all

places, with one partial exception, seem to have been well carried out, together with disinfection of clothing and personal bathing. The approaches to all places were watched, and suspected persons or those from infected localities were, in some instances, quarantined for several days. In the Shikarpur and Jacobabad Districts the four local trains were stopped, owing to the diminution of passenger traffic resulting from these restrictions.

Surgeon-Lieutenant-Colonel Henderson, Civil Surgeon of Hyderabad, states that the value of these measures cannot be questioned, and that they were rapidly and thoroughly carried out in that town, with the result that among 65,000 inhabitants there were no more than 586 cases of plague, and the epidemic lasted little more than three months.

At Shikarpur the system was thoroughly carried out, together with disinfection of clothing and bedding and personal bathing. All dhobies were made to disinfect clothes before washing them. No plague occurred among those segregated, though a dresser was attacked in the plague hospital.

At Kotri a woman was attacked on the day after arrival in the health camp, where she was attending on her daughter-in-law. She was doubtless infected previously.

At the village of Sarhad in Upper Sind, which was badly infected, the Hospital Assistant on duty reports to the following effect :—

(a) The occupants of an infected house and of the adjoining ones were segregated on 13th April ; 2 cases occurred on the 14th and 3 on the 18th April (interval five days), and no others among these people.

(b) In a few houses, the dwellers in which had stayed therein, 1 case occurred on 19th and 3 on 25th April, *i.e.*, a week later than in the camp. On 27th April the remaining inhabitants were therefore segregated ; 2 cases occurred among them on 3rd May (interval six days), and none subsequently.

The efficacy of removal from infected places was well shown in certain of the Sukkur Health Camps, the following cases being noted by the Civil Surgeon :—

(a) During three weeks before 17th April, 106 cases of plague had occurred in Gharibabad. On 17th April the 600 inhabitants were removed into three health camps. There was 1 attack on the day of

removal, and no others between that date and the 17th May, when they returned to their village.

(b) The Limji Chowri quarter had had 4 or 5 attacks daily during the fortnight prior to April 26th. On that date the 232 inhabitants were removed to a health camp ; and not a single case occurred amongst them up to the 28th May, when they returned to their houses, where also they remained healthy.

(c) On April 4th, 1,100 people employed by the North-Western Railway Locomotive Department, among whom several cases had occurred, were moved into camp. Six more cases only occurred amongst them (the last on May 16th), and of these 2, at least, had contracted the disease by visiting their friends in neighbouring villages, leaving 3, or perhaps 4, which originated in the camp. They were segregated until July 2nd.

But although the result of segregation was excellent in six out of the nine health camps in Sukkur, and the great value of removal was shown in all of them, success in three camps was marred by partial failure due to imperfect isolation.

The Civil Surgeon gives me information, the deductions from which may be briefly stated as follows :—

| | |
|---|-------|
| Number of segregation or health camps | 9 |
| Number which they could accommodate | 2,795 |
| Total number of admissions... .. | 3,173 |
| Average number segregated on the last day of each of 13 weeks from 2nd April to 2nd July 1897 * | 1,827 |
| Total number of plague cases in the camps from 4th April to 16th May... .. | 29 |
| Number of the above cases which occurred within eight days of segregation | 19 |
| Balance presumably infected in camps | 10 |
| Ratio of total attacks per mile of population in Sukkur. | 18·3 |
| Ratio of total attacks per mille of average population of camps | 15·2 |
| Ratio per mille of those infected whilst in the camps to the average population of the camp | 5·4 |

* Note.—The daily averages cannot be ascertained, but this figure is approximately correct.

The accompanying tabular statement by the Civil Surgeon, Sukkur, shows the number of attacks in the health camps:—

CIVIL HOSPITAL, SUKKUR.

Statement showing the following information as per Principal Medical Officer, Sind District's No. C—4421, dated 10th October 1897.

| Average population of camps. | 20 | 60 | 33 | 367 | 200 | 232 | 65 | 100 | 750 | 1,827 |
|---|---------------------------------|----------------|----------------------------|----------------------------|-------------------------|------------------------------|---|---------------------------|------------------------------------|--------|
| Intervals between admission to camp and attack. | 1. Old Sukkur Segregation Camp. | 2. New Sukkur. | 3. Old Sukkur Health Camp. | 4. Gharibabad Health Camp. | 5. Mokrani Health Camp. | 6. Limji Chowri Health Camp. | 7. General Health Camp opposite Limji Chowri. | 8. Sweepers' Health Camp. | 9. Railway Locomotive Health Camp. | Total. |
| Number attacked on day of admission | ... | ... | ... | 1 | ... | ... | ... | ... | ... | 1 |
| " 1st day after admission | ... | 1 | ... | ... | ... | ... | 1 | ... | 1 | 3 |
| " 2nd " | ... | 1 | 1 | ... | ... | ... | ... | ... | ... | 2 |
| " 3rd " | ... | 2 | ... | ... | ... | ... | 1 | ... | ... | 3 |
| " 4th " | ... | 4 | ... | ... | ... | ... | 2 | ... | ... | 6 |
| " 5th " | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 |
| " 6th " | ... | 1 | ... | ... | ... | ... | ... | ... | ... | 1 |
| " 7th " | ... | 1 | ... | ... | ... | ... | 1 | ... | ... | 2 |
| " 8th " | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| " 9th " | ... | ... | ... | ... | ... | ... | ... | ... | 3 | 3 |
| " 10th " | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| " after 10th day from admission | ... | (a)2 | ... | ... | (b)1 | ... | (c)2 | ... | (c)2 | 7 |
| Total | 2 | 11 | 1 | 1 | 1 | ... | 7 | ... | 6 | 29 |

(a) One case eleven days after and the other thirteen days after admission; the latter was of a woman who had a miscarriage, and it was rather a doubtful case of plague.

(b) The origin of the case was traced to the man having been on visiting terms with a Marwari in the Limji Chowri, who was subsequently attacked with plague.

(c) These were allowed to pursue their daily vocations, returning to the camps in the evening.

Of the 29 cases, 19 occurred within eight days from segregation and 10 afterwards; and of the latter 9 occurred in three camps and 1 in a fourth. It will be observed that two of the camps in which these late attacks happened held only a small number of persons, who might have been easily controlled. But the Civil Surgeon acknowledges that in three, out of the four camps in which plague attacked

persons later than the eighth day after entry, the occupants were allowed to pursue their daily vocations, returning to the camps in the evening.

It is clear, therefore, that though segregation was not in every instance perfectly carried out at Sukkur, yet, where complete, it proved a marked success; and the very failures add support to other proofs of the power of removal with isolation to arrest an epidemic of plague. I have entered somewhat minutely into this subject, because it is only by a careful examination of all the facts and figures that a conclusion could be arrived at.

I believe that all the available information regarding segregation in Sind has been noted above. It is to be regretted that for some places it is defective.

I am disposed to think removal from an infected locality, with isolation of the sick, but without disinfection of the person or clothes of those segregated, may suffice to stop an outbreak of plague. The Kalankot instance, those of Sarhad mentioned by me, the case in the Karachi Prison, and the experience with regard to hospitals and segregation huts at small towns and villages—attendant relatives, nurses, or servants being but rarely attacked—support this opinion.

I add the following case noted by the Civil Surgeon, Sukkur, in his report:—On the 10th April about 200 people, among whom were 5 plague cases, were found crowded into a few small huts in a garden near Sukkur, about $4\frac{1}{2}$ acres in extent. The sick were isolated in fresh huts in another part of the ground, and the huts were all demolished. The epidemic ceased after the occurrence of 2 more cases on the 11th April 1897.

The above facts show that in removing communities of infected persons from their homes the object to be aimed at is complete isolation. This is not practicable, as a general rule, within the infected areas of towns or villages; for police control is essential, and an improvement in the general surroundings of the people is desirable. Imperfect isolation only results in the further infection of those bodies of people removed from their homes, and in a wider diffusion of the disease. At the same time, as the epidemic in the camp declines, discipline may be somewhat relaxed, and the occupants permitted under surveillance to go outside to their business.

CLINICAL NOTES.

The symptoms and clinical history of plague need not here be described in any detail. Two main types of the disease were noticed, *viz.*, (1) attended with buboes, which comprised about 83 per cent. of the whole; (2) that in which pneumonia was a primary symptom, and buboes generally, if not invariably, absent. Surgeon-Lieutenants Niblock and Cornwall both give the ratio of the first form as about 80 per cent. and of the latter as about 14 per cent. of the whole.

Surgeon-Lieutenant Cornwall thinks that the few remaining cases (in which neither bubo nor pneumonia appeared) may be classed in a third or "intoxication" type. But it seems probable that the non-appearance of these complications may be due to the rapidity of death, and to the fact, alleged by Dr. Cornwall, that this type usually occurs in old people, who, I think, may be less liable to buboes. This Medical Officer states that no *Pestis minor* was observed, nor have any reports of such cases been received. A few cases of the pneumonic form of plague were stopped whilst travelling; and so early as January 22nd I issued a circular enjoining caution with regard to all cases of pneumonia among travellers.

The following notes are mainly from reports of Surgeon-Lieutenants Niblock and Cornwall, I.M.S., who both made excellent use of their large opportunities for clinical observation. Several other Medical Officers, Assistant Surgeons, and Hospital Assistants have contributed useful information.

Primary plague pneumonia has apparently not been accurately differentiated by any Medical Officer in Sind, except those above-named, who give the proportion at 14 per cent. The Civil Surgeon of Hyderabad records 45 cases of pneumonia, of which 6 are stated to have been "primary," but as all the cases treated had buboes, it would appear that there was no primary pneumonia. The records regarding this form of the disease are therefore incomplete; but the figures of all reported cases of pneumonia without buboes have, in the case of certain charges, been shown in Statement VI.

In plague neither the pulse nor the temperature appear to have special characters. The pulse is always rapid and small, never full, sometimes dicrotic, occasionally absent for two or three days at the wrist even in cases which recover. The temperature seldom rises

above 105° and the maximum recorded was $106\cdot8^{\circ}$. In cases which recover without complications there is usually a fall within a week, and in fatal cases often a marked rise just before death. A decided fall in temperature usually followed incision of the buboes, even when done before suppuration had occurred.

All Medical Officers agree that among the most frequent early symptoms are rigors, which are quickly followed by a rise of temperature. Headache is the next among the initial symptoms, and is often severe. Early purging and vomiting—usually bilious—though not unfrequent, are not generally prolonged. The plague ‘facies,’ a listless apathetic condition, with dusky complexion, furred tongue, perhaps suffused and injected conjunctivæ, great prostration with a peculiar slurring of the speech, quickly supervene. Occasionally jaundice appears early. The tongue is at first thickly coated on the dorsum, with the tip and edges red.

Buboes usually appear within 24 or 48 hours of the onset, a tenderness of the part, followed by tumefaction, being first noticed. Pain soon follows, and is often very severe. Buboes occurred in about 80 per cent. of the cases. The following table shows the percentages of those in each region to the total cases in which buboes were recorded :—

| | PLAGUE HOSPITALS. | | | | Four dispensaries in out-stations. | Average ratios in hospital cases. | Average ratios from all returns. |
|---------------------------------|-------------------|---------|------------|-------------------------|------------------------------------|-----------------------------------|----------------------------------|
| | Karachi. | Sukkur. | Hyderabad. | Lyari Quarter, Karachi. | | | |
| Total cases with buboes | 372 | 306 | 399 | 188 | 110 | 1,375 | 1,700 |
| Inguinal and femoral.. | 60·2 | 77 | 79 | 51 | 72·7 | 68 | 67 |
| Axillary | 16·1 | 12·7 | 16·5 | 24 | 17 | 17 | 16 |
| Sub-maxillary and nuchal | 12·1 | 6 | 5 | 24 | 7·2 | 12 | 11·4 |
| Iliac | 1·1 | ? | | ? | ? | ? | 0·2 |
| Multiple | 10·5 | 3·8 | | ? | 2·7 | ? | 5·3 |

Though they do not agree very exactly, yet the figures of individual officers correspond with the general returns as to the predominance of buboes in the groin, and fairly well as regards the percentage of those in the armpit.

At Hyderabad all the cases treated are said to have had buboes, so that probably the totals are overstated. The Civil Surgeon however notes that among the cases treated there, only 11·3 per cent. had pneumonia. Since these include secondary pneumonia, the proportion of primary pneumonia cases (*i. e.*, without buboes), presuming the observations to have been correct, would be small.

Iliac and multiple buboes have not been accurately differentiated in most instances; but it seems probable that the former are more frequent than is supposed. Multiple buboes probably number about 10 per cent. of the whole. Rarely were they very numerous. Hospital Assistant P. D. Talati reports the case of a boy, aged 13, who had buboes in the right gluteal region, right thigh, right leg, right foot, left leg and left side of neck, besides small enlargements of the inguinal glands of both sides. The patient recovered. Of popliteal buboes, only three or four cases were recorded.

Among men, inguinal and femoral buboes were most frequent, whilst among children those in the neck were most common. Women also appeared to have them in the neck and axilla much oftener than men; but perhaps in the case of women, the observations have been less accurate. I have not been able to extract the figures of all cases; but those given below support my statement, which is confirmed by Surgeon-Lieutenant Cornwall, who observed 188 of the cases. I find that in 311 patients with buboes the percentages affecting each region were as under, the groin including both the inguinal and femoral enlargements :—

| | | | | | Groin. | Axilla. | Neck. |
|----------|-----|-----|-----|-----|--------|---------|-------|
| Men | ... | ... | ... | ... | 70 | 20 | 10 |
| Women | ... | ... | ... | ... | 40 | 30 | 30 |
| Children | ... | ... | ... | ... | 39 | 18 | 43 |

The non-appearance of buboes was of decidedly unfavourable import. Those patients in whom they were absent almost invariably died, whilst among those in whom they developed, the mortality was considerably lower than the average of deaths among all treated cases.

Surgeon-Lieutenant Cornwall gives the death-rate among treated cases with bubo as from 35 to 37 per cent. (the general ratio being 60 per cent.), whereas that of cases without buboes was about 90 per cent. Cases in which there was neither pneumonia nor bubo occurred in about 6 per

cent. With regard to the subsidence of buboes shortly before death, Dr. Cornwall very truly says that it is probably caused by absorption of effusion owing to a failing circulation.

About 2 per cent. of all cases had diffuse cellular inflammations (so-called carbuncles) in various situations on the trunks or limbs. A rather frequent site was the malar region. A few such in the feet were attributed to inoculation at the affected part ; but there is no proof of such origin, and their rarity seems to negative the idea. Tonsillitis accompanied many of the buboes in the neck, but whether it precedes or follows the latter has not been shown.

The plague bacillus was found in abundance in freshly incised buboes by Drs. Cornwall and Niblock, but not in the pus after suppuration was established.

Pneumonia.—The proportion of plague cases with primary pneumonia was nearly 15 per cent. ; and the mortality among those treated is given by Dr. Niblock as 70·5 and by Dr. Cornwall at 88 per cent. ; but this difference is probably due to the superiority of the Karachi Plague Hospital building and arrangements.

From Rohri 8 cases of pneumonia out of 54 (18·4 per cent.), with a mortality of 100 per cent., are reported; but it appears that all these had buboes, and it is therefore doubtful whether any were of the “primary” form. From other reports I gather that primary pneumonia occurred in from 5 to 15 per cent. ; and most Medical Officers and subordinates state that the case mortality was nearly 100 per cent. But all officers have not distinguished clearly between the primary and secondary forms, and I believe that many cases of pneumonia among those who died early have been overlooked. Surgeon-Lieutenant Niblock puts the proportion of secondary pneumonia at 11 per cent. and the case mortality at 64 per cent., which is but slightly higher than the general death-rate of treated cases. But under less favourable conditions the fatality from this complication would seem to have been about 90 per cent.

From Hyderabad, out of 399 patients, only 6 cases of primary pneumonia are reported ; of these, 5 (83 per cent.) died. The proportion of all pneumonia cases at Hyderabad is said to have been

11·3 and at Sukkur only 6 per cent. I might be disposed to attribute this difference to the drier and warmer climate of these places as compared with Karachi, had not Surgeon-Captain Boyle, A.M.S., at Rohri near Sukkur reported the incidence of all pneumonia cases to be 14·8 per cent.

Primary plague pneumonia differs somewhat in its characters from the ordinary lobar form. Dr. Cornwall says that "tubular breathing is rarely heard, probably because patients die so soon," and that "if the patients recover, the signs clear up with amazing rapidity." Most cases end fatally in from 24 to 48 hours. All observers agree that the sputa are more bronchitic, less viscid, and less often assume the rusty appearance than in ordinary pneumonia. But the main difference consists in the frequent, and often very free, hæmoptysis which so often occurs in primary plague pneumonia. The blood expectorated is, at first, unmixed with mucus, and the microscope shows it to be a pure culture of the plague bacillus. Free hæmoptysis also occurs in the secondary pneumonia.

Of all hæmorrhages, hæmoptysis was the most frequent. It was always attendant on pneumonia. Hæmatemesis, epistaxis and melæna were seen in one or two per cent. of those treated.

Delirium and coma were frequent and occurred in about 90 per cent. of fatal cases.

Diarrhœa, vomiting and hiccough were unfavourable symptoms, whilst constipation was the rule in cases of recovery (Niblock). Urinary symptoms were infrequent, and albuminuria was not noticed. Slight enlargements of the liver and spleen, and occasionally jaundice, were observed.

Among the less usual symptoms may be mentioned severe conjunctivitis, anterior staphyloma of the sclerotic, keratitis, protrusion of the globe, and secondary abscesses in the scalp or elsewhere (Cornwall); and both Drs. Niblock and Cornwall mention an occasional papular rash.

Abortions occurred in one or two per cent. of all cases. Six women in whom abortion took place, and two in whom it threatened, in the Plague Hospital at Karachi under Dr. Niblock's care, recovered. On the other hand, of Dr. Cornwall's three cases of abortion, one collapsed

quickly, and the others died from spreading buboes ; and Surgeon-Lieutenant King records three abortions with three deaths. A few pregnant women recovered from Plague without aborting.

Diagnosis.—This is said to be somewhat difficult in the early stage of the disease, when the only indications are the state of the pulse and tongue, the appearance and general condition, and the presumption of probability deduced from the history.

Prognosis.—This is uncertain, for many patients in a favourable condition have died suddenly on imprudently rising from bed or taking solid food, or their circulation has rapidly failed even whilst recumbent. The conditions favourable to recovery are early and efficient nursing, with suitable food and complete recumbency. Severe or continued diarrhoea or vomiting are bad signs ; high delirium and coma are most ominous. Primary pneumonia usually indicates early death, and hæmorrhages of all kinds are most frequent in the fatal cases. On the other hand, constipation and an absence of gastric and cerebral disturbances justify a hopeful prognosis. With the exception that those in the neck, particularly if bilateral, are specially dangerous to life, the presence of buboes is favourable, even though they be multiple.

The following case may be added to those recorded under “ incubation ” to show the ability to bear exertion or shock in the early stage of the disease and the uncertainty of prognosis :—

Mimgoo, aged 60, being seized with plague in Hyderabad on or about May 4th, 1897, went on board the ferry steamer at Gidu Bander on May 13th, and whilst crossing, jumped from the boat into the river Indus. He was rescued by the boatmen and taken to the Plague Hospital at Kotri, where his temperature was found to be 103 and buboes were seen in his neck. The man recovered after 37 days, and said that he had been driven by pain and delirium to attempt suicide.

Assistant Surgeon Soobhan Ali, M.R.C.S., reported the case of a child, aged two years, whose recovery from plague, with bubo in the neck, was followed, during convalescence, by an attack of measles which she also survived.

Treatment.—The essential conditions for the successful management of plague patients are well organized hospitals, good nursing and judicious feeding.

Hospitals.—Hospital organization was somewhat delayed, owing to the fact that isolation was not in the beginning compulsory, and because people were at first absolutely unwilling to submit to removal and almost equally averse to treatment at their homes. When the epidemic rapidly extended and a portion of the people began to recognize the value of hospital treatment, the demand for accommodation increased very quickly. Later, isolation was made compulsory, but before that time the arrangements were complete. The requirements of each place were supplied by the Municipalities, which provided all essentials with much promptness. In Karachi the needs were liberally assisted by a Plague Relief Fund subscribed by the public.

Medical treatment was mainly restricted to the administration of stimulants such as alcohol, ammonia and ether, and the use of cardiac tonics of which strychnine proved the most useful. Caffeine is a good stimulant and relieves the headache; and bromides with morphia sometimes act well as sedatives. Sulphonal is a good hypnotic in simple insomnia without pain. For the delirium, hyoscine is by far the best sedative. Diarrhoea can generally be stopped by a starch and opium enema and, when mild, is much relieved by salol. Headache, delirium and fever are moderated by the use of the ice-cap and by cold sponging.

It seems to be agreed that of the few drugs which are internally required, the most valuable are alcohol, strychnine, caffeine, hyoscine, sulphonal, bromides, morphia or opium, and perhaps ammonia and ether. A dose of calomel was often found beneficial at the onset of the illness.

Feeding, as Surgeon-Lieutenant Cornwall truly remarks, is not important during the early stage, and this officer also very rightly deprecates early stimulation—maxims which are too often disregarded in the management of fevers. After the first few days, or on the decline of pyrexia, frequent liquid nourishment and alcohol are necessary. The food should, at first, consist mainly of milk and thin farinaceous food. Mutton or chicken broths may also be given. Later, rice and other soft food is allowed, full meals being for some time forbidden owing to the risk of fatal syncope. Of external remedies the only drugs commonly required are belladonna extract (with glycerine) for

application to the buboes, and suitable antiseptics for use when these are opened by incision or suppuration.

Early incision of the buboes when painful and tense is much advocated by Drs. Niblock and Cornwall, who say that it relieves pain, causes a decided and usually permanent fall of temperature and generally prevents suppuration and sloughing of skin and cellular tissue. If well washed with antiseptic lotion, dusted with iodoform and covered with a dry dressing, the swelling generally subsides and heals up without any suppuration. To effect these good results the bubo must be cut before suppuration has set in. If the operation is delayed a day or two too long, it may be found that the skin and other soft parts have sloughed. Many of the temperature charts demonstrate the efficacy of these early incisions which were constantly practised in Karachi.

In 11 typical and consecutive cases of recovery recorded by Surgeon-Lieutenant Niblock in which the buboes were incised, I find from the charts that after incision there was in all an immediate fall of temperature. In 5 cases this averaged 3·8 degrees within 12 hours; and in the other 6 it amounted to 4 degrees Fahrenheit in an average period of 30 hours. The average day of the disease on which the incisions were made was the fifth, varying from second to eighth day. In 9 of the cases the temperature after incision scarcely rose above normal; and even in the remaining 2 it was succeeded by a marked defervescence, which was only interrupted by cerebral complications in the one and by a fresh bubo in the other instance.

In 9 consecutive fatal cases, of which the same observer has submitted charts, I find that 6 obtained an average reduction of 3 degrees of temperature in 22 hours after incision of their buboes, the average date of which was the fourth day from that of attack. In 3 cases there was no effect on the temperature; the condition of one of these at the time of incision was apparently that of collapse with a normal temperature, and death occurred 24 hours later after a rise of temperature. The average duration of these 9 fatal cases was 6 days, but one lived nine days and another 15 days.

These are only examples of a large number of cases in which incision was followed by great relief and a decline of fever.

Among all patients who received treatment, the average duration of the fatal cases was 3·2 days ; whilst in the best organized hospitals it was 5·1 days :—

| | | | | | |
|---------------------|-----|-----|-----|-----|------------------|
| In Karachi, average | ... | ... | ... | ... | = 4·5 days. |
| „ Hyderabad „ | ... | ... | ... | ... | = 7 „ |
| „ Sukkur „ | ... | ... | ... | ... | = 3·9 „ |
| | | | | | <hr/> 15·4 <hr/> |

The maximum average duration, in any charge, of the fatal cases was 7 days ; and it may be safely said that after the fifth day the prospect of recovery is good. Nearly two-thirds (Karachi=64 per cent.) of the fatal cases in hospitals occurred within 48 hours of admission ; so that this proportion received but little benefit from treatment. The average stay in hospital of all patients who recovered was 29 days, and of those treated by five Medical Officers in organized hospitals 32 days, ranging from 24 in Hyderabad to 40 at Shikarpur. The shortest average recorded time required for treatment in all charges was 13 days, and the longest 41 days ; but the average period required for convalescence may be safely stated as about 30 days.

GENERAL STATISTICS.

Adopting the revised municipal returns of Karachi, the total cases of plague in Sind reported to my office were :—

| | Cases. | Deaths. | Mortality per cent. |
|--|--------|---------|---------------------|
| Karachi Town | 4,069 | 3,318 | 81·1 |
| Do. Cantonment | 86 | 62 | |
| Other towns reported by Medical Officers and Assistants | 1,670 | 1,222 | 68 |
| Villages reported by other Officials | 614 | 580 | 94 |
| Total ... | 6,439 | 5,182 | 80·4 |

Of these totals the details are given in Statement VII. This shows the number of cases reported by Medical Officers and medical subordinates to have been 3,007. In 2,317 of these, particulars were given regarding sex and caste. It is found that the attacks among males per

mille of population were 11·0, whilst amongst females they were only 5·3, and it will be seen that this ratio of about two to one prevailed in each of the five larger towns affected by the epidemic. As I see no reason to think that such a large proportion of cases among females could have been concealed, the correctness of the figures may therefore be assumed; and the disproportion can only be attributed to the fact that the men, being largely engaged in business or labour, moved about from town to town and from house to house much more than the women who, being in a considerable degree secluded, were less exposed to risks of infection.

Taking the statistics of Karachi as a whole, the men were attacked at the rate of 42 and the women 39 per mille, an approximation which is very different from the disproportion in the provincial towns and Karachi hospitals. This may be owing to the greater predominance in Karachi of certain castes, such as Marathas, Kutchis and low-caste Hindus, among whom the women are less secluded than those in the towns of Upper Sind. These places also contained large numbers of Hindu males engaged in trade, many of whom had run away from Karachi and whose families were living elsewhere. These men were mainly responsible for the spread of the plague in Sind. Possibly they were aided by the rats, whose action in this respect would, however, be more local.

Among Hindus and Mahomedans the ratios of attacks to population were respectively 11·0 and 6·7 per mille, but this disparity was not so evenly shown in the several towns. There is no question that just as the men, who travelled more than the women, were doubly prone to attack, so the Hindus, a larger number of whom were engaged in trade and as artisans, suffered more heavily, because their avocations took them more from home, and thus not only exposed individuals to more frequent risks of infection, but led them to diffuse the plague amongst their neighbours and in the province to a far greater extent than was the case with the more home-staying Mahomedans. If this argument be correct, it strongly supports isolation and segregation as measures for arresting the diffusion of plague.

The attacks recorded among "other castes" are so few as not to permit of sure deductions. In Rohri two of "other castes" were attacked in a population of 51 (=39 per mille); but taking only the figures of Karachi and Sukkur, they give a ratio of 7·7 per mille.

This nearly corresponds with that of the Mahomedans and accords therefore with the above theory, for those in this class were mainly Jews, Parsis and Christians, who, by the force of circumstances, are much more isolated in their environments than other inhabitants and less prone to wander from their homes.

In Karachi, out of 4,069 cases, a municipal return gives the proportions of those attacked in different age periods as under :—

| | | |
|---------------------|-------------------------|---|
| Aged under 1 year | =1 in 99 of population. | |
| „ from 1 to 4 years | =1 in 65 | „ |
| „ „ 5 to 20 | „ =1 in 23·5 | „ |
| „ „ 20 to 55 | „ =1 in 22·2 | „ |
| „ above 55 | „ =1 in 14·0 | „ |

It therefore appears that adults are from three to five times as liable to attack as small children, and that old people are between one and a half times and twice as liable to Plague as adult persons.

I am unable to give the ratios of attacks to population by ages at other places ; but the ratios to admissions at Hyderabad and Sukkur are here shown. The ages are approximate only, accuracy in this matter not being attainable in India ; but the groups may be taken as fairly correct, for these cases were observed in hospitals :—

| Age periods. | | | Hyderabad, 399 cases | Sukkur, 378 cases | Total recorded cases. |
|--------------------|-----|-----|-------------------------|----------------------|-------------------------------|
| | | | per cent. | per cent. | |
| 12 years and under | ... | ... | 21·3 | 12·6 | Hyderabad =586 Sukkur =537 |
| 13 to 20 years | ... | ... | 15·7 | 14·2 | |
| 21 to 45 years | ... | ... | 46·3 | 59·5 | |
| Above 45 years | ... | ... | 16·5 | 13·5 | |

This table agrees with the above in indicating the great preponderance of attacks amongst adults over those amongst children, and also the larger relative proportion of aged persons attacked.

Case Mortality.—This can be best presented as follows :—

| | | | | | | Per cent. |
|---|-----|--|--|--------------------------------------|-----|-----------|
| Mortality rate of all cases in Sind including Karachi | | | | | | 80.4 |
| Do. | do. | in Karachi | ... | { Males... 80.5 Females... 83.0 } | ... | 81.1 |
| Do. | do. | among 3,007 cases, including treated, reported by Medical Officers and Assistants... | | | | 66.0 |
| Do. | do. | in 2,317 of the above in which details are recorded. | { Males... 70 Females... 64 Children... 63 } | ... | | 68.0 |
| Case mortality of treated cases among Mahomedans | | | | | | 67.0 |
| Do. | do. | Hindus | ... | ... | ... | 68.0 |
| Do. | do. | other castes | ... | ... | ... | 60.0 |
| Do. | do. | at and under 12 years | | | | 68.0 |
| Do. | do. | from 13 to 20 years | | | | 69.0 |
| Do. | do. | from 21 to 45 years | | | | 71.0 |
| Do. | do. | after 46 years | ... | ... | ... | 86.0 |

The attached chart shows the general mortality by age periods of Karachi Town, of the whole province, and of the cases treated in three Plague Hospitals. Karachi, which contained a larger proportion of non-treated cases, shows a higher mortality rate than the province as a whole. Among all cases, including treated, the rise of the death-rate from childhood to middle age is not considerable, but after 45 years of age the increase is very decided.

The beneficial effect of hospital treatment, together with its greater influence over young patients, are well shown. In preparing this chart I have used for the hospital figures the returns of Karachi, Hyderabad and Sukkur only, and have omitted the smaller and imperfectly organized hospitals. In the hospitals abovenamed the mean mortality was 63 per cent. The mean general mortality of treated cases throughout Sind was 61.5 per cent.

| | | | | | | | Per cent. |
|----------|-----|-----|-----|-----|-----|-----|-----------|
| Males | ... | ... | ... | ... | ... | ... | 61.7 |
| Females | ... | ... | ... | ... | ... | ... | 63.0 |
| Children | ... | ... | ... | ... | ... | ... | 59.0 |

Children have not been separately shown by several officers, so that the above ratio is, in their case, calculated from only 98 cases.

The reductions of mortality ratios effected by treatment were :—

| | | | | | | Reduction per cent. |
|----------------------|-----|-----|-----|-----|-----|---------------------|
| Throughout Sind | ... | ... | ... | ... | ... | 18·6 |
| Hospitals in Karachi | ... | ... | ... | ... | ... | 23·0 |
| Do. Hyderabad | ... | ... | ... | ... | ... | 8·5 |
| Do. Sukkur | ... | ... | ... | ... | ... | 8·8 |
| Do. other charges | ... | ... | ... | ... | ... | 6·2 |

The following statement contrasts the mortality ratios per cent. in the three larger Plague Hospitals with each other, and with the general ratios :—

| | General case mortality per cent. | Hospital mortality per cent. | RATIOS PER CENT. BY AGE PERIODS. | | | | | | | |
|----------------------------|----------------------------------|------------------------------|----------------------------------|----------|--------------|----------|--------------|----------|-----------------|----------|
| | | | Children. | | 13—20 years. | | 21—45 years. | | Above 45 years. | |
| | | | General. | Treated. | General. | Treated. | General. | Treated. | General. | Treated. |
| | | | | | | | | | | |
| Mortality ratios in Sind.. | 80·4 | 61·8 | 68·0 | ... | 69·0 | ... | 71·0 | ... | 86·0 | ... |
| „ „ Karachi .. | 81·1 | 58·0 | 80·0 | 60·7 | 80·5 | 65·5 | 79·6 | 55·3 | 89·5 | 68·7 |
| „ „ Hyderabad. | 76·5 | 68·0 | 69·7 | 61·8 | 69·7 | 68·2 | 81·3 | 65·9 | 81·6 | 79·4 |
| „ „ Sukkur ... | 72·8 | 64·0 | 67·1 | 58·3 | 77·6 | 59·2 | 71·8 | 62·6 | 79·4 | 76·4 |

The hospital figures for Karachi are those of the Civil Hospital and Lyari Hospitals only ; for I have no information regarding private and other hospitals under the Plague Committee. Probably the total results of hospital meatment would give Karachi a somewhat higher case mortality.

REMARKS ON REPORT.

It will be seen that I have drawn special attention to the following points :—

(1) The slowness of the spread of plague in the epidemic under notice ; that is to say, the long and tolerably definite interval which elapses between importation and localization. This feature was first brought to notice in a paper read to this Society by Surgeon-Captain Grayfoot.

(2) The curious occurrence of a single case of plague in the Karachi Prison seems to demonstrate the value of sanitary precautions; for there is scarcely a doubt that they alone prevented the general infection of about 300 prisoners living in the midst of an infected city.

(3) I have illustrated by figures the comparative inefficacy of the medical inspection of passengers to arrest the spread of plague. The necessity for substituting for it detention and observation in the case of persons from places known to be infected seems to me very clear. It will no doubt be possible and, in the case of certain individuals and classes of persons, even essential to trust in some cases to surveillance; otherwise the interference with trade and with public and private business would become intolerable. But restrictions on travel, qualified by class distinctions, are in India unavoidable if it be desired to limit and control the spread of plague. To effect these objects the only reliable measures applicable to the masses of the population in this country are detention with observation for a period not exceeding ten days, associated, of course, with isolation of those infected; and these measures are no less necessary—though more difficult to carry out—in controlling movements within urban limits, than in the case of travellers from place to place. It is satisfactory to see that these principles have for several months past been largely adopted by Government. It is not in the nature of things that the success of their application can always be fully demonstrated; and hence the tendency to underestimate their value, or to yield to impatience or weariness, when the results—owing to the magnitude of the undertaking or defects in the arrangements—are imperfect.

The very people who most loudly cry out against the oppressiveness of restrictions on their movements have justified these by themselves fleeing from the danger of infection, thereby acknowledging its powers to harm themselves whilst ignoring the injury caused by its conveyance to others.

(4) I have ventured to offer certain opinions on the channels of infection; and, as regards this subject, I have to say that I am prepared for criticism and perhaps, in some points, for correction, but do not feel that my general conclusions will be upset.

(5) I think that the information bearing upon infection and the period of incubation will prove interesting. Every case referred to was accurately recorded.

(6) As regards the segregation of the dwellers in infected localities and the isolation of the sick, the facts reported seem to me, like the experiences of later observers in other places, to prove the absolute reliability of the former, and the value of the latter. As regards segregation, failure, whenever it has occurred, has been due to defects in organization or control—in fact, to the absence of segregation properly so called.

I regret that I did not collect any figures showing the incidence of attacks amongst attendants upon patients in hospital; but the general opinion of Medical Officers in Sind was that it was extremely light.

These results all tend to show that the germs of Plague will only thrive and attain their full potency under certain insanitary conditions, and that whilst they cling to the soil, the air, to living beings, or to particular objects in favourable spots, they do not flourish when transferred to places where fresh air and cleanliness prevail.

(7) On the subject of treatment I have had but little to say, and for that I am indebted to others. The influence of drugs and other therapeutic measures in Plague is very slight; yet the effects of nursing and general management have been by no means inconsiderable, and I commend to your notice the figures showing the results of Hospital treatment.

G. BAINBRIDGE, M.D.,
Surgeon-Major-General.

STATEMENT No. I.

Showing persons attacked and died from Plague in Karachi during each week of the epidemic.

| Week ending | | | | Number of | | Ratio of total mortality of the population per thousand per annum. |
|--------------------|-----|-----|-----|-----------|---------|--|
| | | | | Cases. | Deaths. | |
| 10th December 1896 | ... | ... | ... | | | 32.00 |
| 17th do. | ... | ... | ... | 12 | 11 | 52.96 |
| 24th do. | ... | ... | ... | 21 | 21 | 61.96 |
| 31st do. | ... | ... | ... | 30 | 27 | 81.55 |
| 7th January 1897 | ... | ... | ... | 107 | 103 | 103.26 |
| 14th do. | ... | ... | ... | 184 | 159 | 111.74 |
| 21st do. | ... | ... | ... | 210 | 200 | 106.44 |
| 28th do. | ... | ... | ... | 194 | 181 | 244.13 |
| 4th February 1897 | ... | ... | ... | 321 | 295 | 215.53 |
| 11th do. | ... | ... | ... | 280 | 263 | 170.52 |
| 18th do. | ... | ... | ... | 270 | 239 | 150.39 |
| 25th do. | ... | ... | ... | 270 | 217 | 167.34 |
| 4th March 1897 | ... | ... | ... | 252 | 197 | 137.16 |
| 11th do. | ... | ... | ... | 290 | 207 | 164.16 |
| 18th do. | ... | ... | ... | 243 | 182 | 145.10 |
| 25th do. | ... | ... | ... | 271 | 188 | 153.04 |
| 1st April 1897... | ... | ... | ... | 266 | 192 | 144.04 |
| 8th do. | ... | ... | ... | 215 | 172 | 112.27 |
| 15th do. | ... | ... | ... | 165 | 116 | 85.26 |
| 22nd do. | ... | ... | ... | 182 | 127 | 88.44 |
| 29th do. | ... | ... | ... | 123 | 86 | 59.84 |
| 6th May 1897 | ... | ... | ... | 82 | 65 | 53.49 |
| 13th do. | ... | ... | ... | 58 | 52 | 40.25 |
| 20th do. | ... | ... | ... | 37 | 23 | 29.66 |
| 27th do. | ... | ... | ... | 40 | 20 | 29.66 |
| 3rd June 1897... | ... | ... | ... | 29 | 29 | 31.24 |
| 10th do. | ... | ... | ... | 9 | 7 | 20.65 |
| 17th do. | ... | ... | ... | 1 | 1 | 19.06 |
| 24th do. | ... | ... | ... | 5 | 2 | 26.48 |
| 1st July 1897 | ... | ... | ... | 2 | 2 | 27.54 |
| 8th do. | ... | ... | ... | 2 | 2 | 21.18 |
| 15th do. | ... | ... | ... | 3 | 2 | 23.30 |
| 22nd do. | ... | ... | ... | 5 | 3 | 19.60 |
| 29th do. | ... | ... | ... | 2 | 1 | 27.54 |
| Total | | | | 4,181 | 3,391 | |

STATEMENT No. II.

Showing imported cases of Plague and their places of origin, with dates of importation and of local infection.

Friday, July 1st, 1898.

61

[Vol. II, No. 7.

| Towns Inspected. | Total cases. | Date of first imported case. | Date of first local case. | Imported cases. | From Karachi. | From Hyderabad. | From Sukkur. | From Bombay. | From Cutch-Mandvi. | From elsewhere. | Remarks. |
|-------------------------|--------------|------------------------------|---------------------------|-----------------|---------------|-----------------|--------------|--------------|--------------------|-----------------|--|
| Karachi | 4,141 | ? | 10th December 1896. | ? | .. | .. | .. | .. | .. | .. | Exclusive of Manora. |
| Manora | 40 | 15th January 1897.. | 6th March 1897. | 11 | 2 | .. | .. | .. | 7 | 4 | First case reported on 10th December 1896. |
| Jungshahi | 29 | 17th December 1896. | 22nd February " | 16 | 12 | .. | .. | .. | .. | .. | |
| Tata | 51 | 10th January 1897.. | 23rd March " | 34 | 34 | .. | .. | .. | .. | .. | |
| Kotri, N.-W. Railway | 15 | 24th " | Nil | 15 | 14 | 1 | .. | .. | .. | 3 | |
| Do. Town | 29 | 24th February " | 23rd March 1897. | 12 | 1 | 8 | .. | .. | .. | .. | |
| Sehwan | 2 | 24th January " | Nil | 2 | 1 | 1 | .. | .. | .. | .. | |
| Dadu | 9 | 10th January " | " | 9 | 8 | 1 | .. | .. | .. | .. | |
| Pad Idan | 1 | 27th " | " | 1 | 1 | .. | .. | .. | .. | .. | |
| Kahuki | 2 | 3rd April " | " | 2 | .. | 2 | .. | .. | .. | .. | |
| Hyderabad | 586 | 7th January " | 28th February 1897. | 37 | 35 | .. | .. | .. | .. | 2 | |
| Tando Allahyar | 17 | 4th January " | 15th January " | 4 | 3 | .. | .. | .. | .. | 1 | |
| Naushahro and Tharushah | 6 | 7th February " | Nil | 6 | 2 | 4 | .. | .. | .. | .. | |
| Hala | 6 | 30th March " | " | 6 | .. | 6 | .. | .. | .. | .. | |
| Mirpur Khás | 3 | 1st February " | " | 3 | 1 | 2 | .. | .. | .. | .. | |
| Sukkur | 537 | Unknown | 12th February 1897. | None | reco | ded. | 24 | .. | .. | .. | |
| Rohri | 153 | 24th February 1897.. | 6th April " | 24 | .. | .. | 1 | .. | .. | .. | |
| Ghotki | 3 | 27th March " | Nil | 3 | 1 | .. | 1 | .. | .. | .. | |
| Sarhad | 15 | 18th " | 11th April 1897. | 1 | .. | .. | 1 | .. | .. | .. | |
| Khairpur Dharki | 34 | ? | 12th " | Not recorded | .. | .. | .. | .. | .. | .. | |
| Thatti | 118 | 10th March 1897 | 1st May " | Not recorded | .. | .. | 25 | .. | .. | .. | |
| Shikarpur | 32 | 30th December 1896. | 11th March " | 28 | 3 | .. | 18 | .. | .. | .. | |
| Larkhana | 18 | 22nd March 1897 | Nil | 18 | .. | .. | 3 | .. | .. | .. | |
| Jacobabad | 4 | 12th " | 22nd March 1897. | 3 | .. | .. | .. | .. | .. | .. | |
| Total | 5,851 | | | 235 | 118 | 26 | 72 | 2 | 7 | 10 | |

STATEMENT No. IV.

Showing the result of the inspection of Railway Passengers on the North-Western Railway in Sind, 1st January to 31st July 1897.

| 1 | 2 | 3 | 4 |
|-------------------------------|--|------------------------------------|-----------------------------|
| Name of Station. | Number of persons detained on suspicion. | Found to be suffering from Plague. | Remarks. |
| <i>Platform Inspection.</i> | | | |
| Karáchi | 102 | 1 | |
| Hyderabad | 1 | | |
| Dádú | 163 | 5 | |
| <i>Ordinary Inspection.</i> | | | |
| Jungsháhi | 13 | 8 | Hospital Assistant. |
| Kotri Main | 13 | 13 | Assistant Surgeon. |
| Kotri Bandar | 1 | 1 | Do. |
| Sehwan | 2 | 2 | Dispensary Medical Officer. |
| Dádú | 50 | 4 | Hospital Assistant. |
| Rahuki | 2 | 2 | Do. |
| Pad Idan | 1 | 1 | Do. |
| Sukkur | 111 | | Do. |
| Rohri | 245 | 4 | Do. |
| Ghotki | 2 | 2 | Do. |
| Shikárpur | 6 | 2 | Do. |
| Gidu Bandar { From Hyderabad. | 9 | 2 | } Do. |
| Ferry. { „ Kotri ... | 11 | 4 | |
| Total ... | 732 | 51 | |

STATEMENT NO. VI.
The Buboes in Plague.

| Hospital or Place at which recorded. | Cases observed. | SITE OF BUBOES. | | | | Total Cases with Buboes. | Pneumonia without Bubo. | No Pneumonia. No Bubo. | Record Imperfect. | Totals. |
|--|-----------------|-----------------|---------|-------|--------|--------------------------|-------------------------|------------------------|-------------------|---------|
| | | Groin. | Axilla. | Neck. | Ittac. | | | | | |
| Plague Hospital, Karachi ... | 461 | 224 | 60 | 45 | 4 | 39 | 68 | 21 | ... | 461 |
| Surg.-Lieut. Cornwall, Karachi ... | 237 | 96 | 46 | 46 | ... | ... | 35 | 14 | ... | 237 |
| Hospital Assist. Shaik Abdul Raymon, Karachi ... | 142 | 36 | 14 | 35 | ... | 10 | 17 | ... | 30 | 142 |
| Assist. Surg. Shaik Subhan Ali, Karachi ... | 136 | 54 | 19 | 23 | ... | 10 | 24 | 6 | ... | 136 |
| Manora ... | 40 | 21 | 4 | 3 | ... | ... | 10 | 2 | ... | 40 |
| Jungshahi ... | 29 | 9 | 3 | 2 | ... | ... | ... | 4 | 11 | 29 |
| Tatta ... | 51 | 33 | 8 | 1 | ... | 2 | 44 | 2 | ... | 51 |
| Kotri ... | 29 | 17 | 4 | 2 | ... | 1 | 24 | 3 | ... | 29 |
| Sehwan ... | 2 | 1 | 1 | ... | ... | ... | ... | ... | ... | 2 |
| Dadu ... | 9 | 8 | ... | ... | ... | ... | 1 | ... | ... | 9 |
| Hyderabad ... | 399 | 315 | 64 | ... | * | * | ... | ... | ... | 399 |
| Tando Allayár ... | 17 | 3 | 2 | 2 | ... | 1 | 8 | 5 | ... | 17 |
| Hala ... | 6 | 4 | ... | 1 | ... | ... | ... | 1 | ... | 6 |
| Mirpur Khás ... | 3 | 2 | ... | 1 | ... | ... | 3 | ... | ... | 3 |
| Sukkur ... | 378 | 237 | 39 | 18 | ... | 12 | 306 | ... | 72 | 378 |
| Rohri ... | 54 | 44 | 4 | ... | ... | 6 | 54 | ... | ... | 54 |
| Ghotki ... | 18 | 7 | 2 | 3 | ... | ... | 12 | ... | 6 | 18 |
| Shikárpur ... | 32 | 30 | ... | 2 | ... | ... | 32 | ... | ... | 32 |
| Total ... | 2,043 | 1,141 | 270 | 184 | 4 | 81 | 1,700 | ... | ... | 2,043 |
| Percentage to total cases observed ... | ... | 55.9 | 13 | 9 | 0.2 | 4.0 | 83.2 | ... | ... | ... |

* 20 in other parts.

STATEMENT

Vital Statistics

| | | Cases seen by Medical Officers and Assistants. | Total cases recorded by Medical Officers and Assistants. | RATIOS OF ATTACKS PER MILLE OF POPULATION. | | | | | | | | | | | | | | Total deaths. | Total case mortality per cent. |
|--|----|--|--|--|------------|----------|------------|-----------|------------|-----------------------|-------------|------------|---------|------------|---------|------------|-------|---------------|--------------------------------|
| | | | | Males. | Per mille. | Females. | Per mille. | Children. | Per mille. | Total cases recorded. | Mahomedans. | Per mille. | Hindus. | Per mille. | Others. | Per mille. | | | |
| Karachi | .. | 1,337 | 799 | 504 | 8.7 | 177 | 4.3 | 118 | ? | 783 | 320 | 6.2 | 427 | 10.1 | 36 | 7.5 | 479 | 60 | |
| Hyderabad | .. | 586 | 586 | 412 | 14.5 | 174 | 6.6 | ? | ? | 586 | 139 | 6.3 | 447 | 14.0 | .. | .. | 451 | 70 | |
| Sukkur | .. | 537 | 537 | 390 | 21.0 | 147 | 13.4 | ? | ? | 537 | 232 | 19.5 | 301 | 18.0 | 4 | 8.0 | 391 | 7.2 | |
| Rohri | .. | 153 | 153 | 101 | 23.0 | 52 | 11.6 | ? | ? | 153 | 15 | 4.2 | 136 | 26.0 | 2 | 39.0 | 92 | 60 | |
| Shikarpur | .. | 32 | 32 | 28 | 1.3 | 4 | 0.2 | ? | ? | 32 | 5 | 0.3 | 27 | 4.6 | .. | .. | 20 | 62 | |
| Other Charges | .. | 204 | 210 | 141 | .. | 38 | .. | 31 | ? | 210 | 24 | .. | 186 | .. | .. | .. | 144 | 68 | |
| Totals .. | | 2,849 | 2,317 | 1,576 | *11.0 | 593 | *5.3 | 149 | ? | 2,301 | 735 | *6.7 | 1,524 | *11.0 | 42 | *7.0 | 1,577 | 68 | |
| Details incomplete.. | | .. | 690 | .. | .. | .. | .. | .. | .. | 706 | .. | .. | .. | .. | .. | .. | 416 | 60 | |
| Total cases reported by Medical Officers and Assistants .. | | 2,849 | 3,007 | .. | .. | .. | .. | .. | .. | 2,007 | .. | .. | .. | .. | .. | .. | 1,993 | 60 | |
| Add— | | | | | | | | | | | | | | | | | | | |
| Karachi cases not included in the above .. | | .. | 2,818 | .. | .. | .. | .. | .. | .. | 2,818 | .. | .. | .. | .. | .. | .. | 2,609 | .. | |
| Provincial do. .. | | .. | 614 | .. | .. | .. | .. | .. | .. | 614 | .. | .. | .. | .. | .. | .. | 580 | .. | |
| Total cases in Sind. | | ... | 6,439 | .. | .. | .. | .. | .. | .. | 6,439 | .. | .. | .. | .. | .. | .. | 5,182 | 80.4 | |

* " Others ch

No. VII.

Plague in Sind.

| MORTALITY PER CENT. | | | | | | | | | | | TREATED IN HOSPITALS OR ISOLATION SHEDS. | | | | | | | | | | | |
|---------------------|----------|-----------|-----------|-----------|-------------|-----------|---------|-----------|---------------|-----------|--|--------|----------|-----------|-----------------------------|--------------------------------|--------|-----------|----------|-----------|-----------|-----------|
| Per cent. | Females. | Per cent. | Children. | Per cent. | Mahomedans. | Per cent. | Hindus. | Per cent. | Other Castes. | Per cent. | Total treated. | Males. | Females. | Children. | Total deaths among treated. | Case Mortality per cent. | | | | | | |
| | | | | | | | | | | | | | | | | Total case Mortality per cent. | Males. | Per cent. | Females. | Per cent. | Children. | Per cent. |
| 59 | 105 | 59 | 73 | 61 | 193 | 60 | 263 | 61 | 23 | 64 | 824 | 534 | 194 | 96 | 481 | 58 | 309 | 58 | 115 | 59 | 57 | 60 |
| 81 | 115 | 66 | ? | ? | 115 | 82 | 336 | 75 | .. | .. | 399 | 304 | 95 | ? | 272 | 68 | 206 | 67 | 66 | 69 | ? | ? |
| 73 | 103 | 70 | ? | ? | 158 | 68 | 231 | 76 | 2 | 50 | 409 | 293 | 116 | ? | 263 | 64 | 182 | 62 | 81 | 70 | ? | ? |
| 60 | 31 | 60 | ? | ? | 8 | 53 | 84 | 61 | .. | .. | 144 | 97 | 47 | ? | 83 | 57 | 57 | 59 | 26 | 55 | ? | ? |
| 68 | 1 | 25 | ? | ? | 3 | 60 | 17 | 63 | .. | .. | 30 | 27 | 3 | ? | 18 | 60 | 17 | 63 | 1 | 33 | ? | ? |
| 70 | 24 | 63 | 21 | 68 | 15 | 62 | 129 | 68 | .. | .. | 36 | 29 | 5 | 2 | 22 | 68 | 20 | 68 | 1 | 20 | 1 | 50 |
| 70 | 379 | 64 | 94 | 62 | 492 | 67 | 1,060 | 68 | 25 | 60 | 1,842 | 1,284 | 460 | 98 | 1,139 | 61.8 | 791 | 61.7 | 290 | 63.0 | 58 | 59.0 |
| .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 189 | .. | .. | .. | 112 | 59.0 | .. | .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2,031 | .. | .. | .. | 1,251 | 61.5 | .. | .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2,031 | .. | .. | .. | 1,251 | 61.5 | .. | .. | .. | .. | .. | .. |

excluded.

REPORT ON THE MONSTER EXHIBITED BY DR. T. B.
NARIMAN AT THE SOCIETY'S MEETING ON FRIDAY,
MAY 6TH, 1898.

By SURGEON-MAJOR W. H. QUICKE, F.R.C.S., AND SURGEON-
CAPTAIN C. H. L. MEYER, M.D.

WE do not propose to enter into any detailed description of the specimen, but rather to draw attention to points of interest and to advance some suggestions as to the causations of the malformations and deficiencies present.

External appearances.—The monster consisted of two lower extremities, external female genital organs, and above these an irregularly lobulated mass which on dissection proved to be the remnants of the head and trunk.

Lower limbs.—The left limb was larger than the right. The limbs had evidently been subjected to marked pressure, as evidenced by facetting and deep folds on the skin.

On dissection.—Skin thin; very little subcutaneous fat; beneath the latter a layer of dense areolar tissue, reaching to within a short distance of the bones. This tissue formed the bulk of the limbs. Close to the bones there was a considerable quantity of lobulated, adipose tissue intermixed with a scanty amount of striated muscular tissue. Here the large vessels of the limbs were found. The periosteum was very thick, and was easily stripped off the bones.

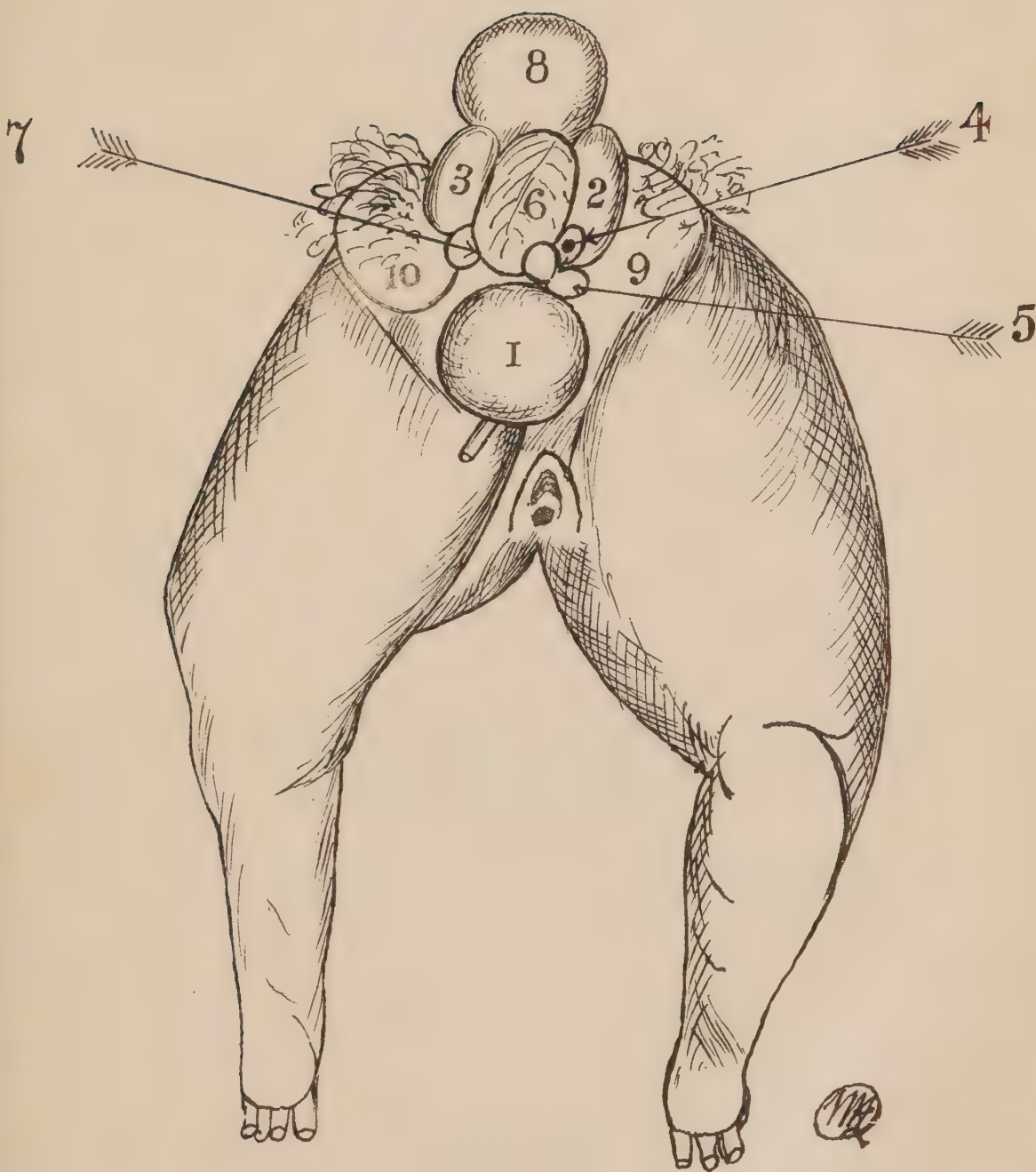
The femur, tibia, fibula, tarsus, metatarsus, and phalanges were well formed. The latter two corresponded to the number of toes present. The joints were freely moveable, but their synovial cavities were not formed.

On careful dissection no traces of any nerves could be found.

The external organs of generation—were well formed. At the posterior part, just within the vulva, was a small aperture, which was subsequently found to pass into the rectum.

Vagina, uterus, and bladder were absent.

The irregular lobulated mass.—This formed the remaining parts of the monster. It consisted of 10 masses.



A Monster.
Exhibited by Dr. T. B. Nariman
May 6th 1898.

No. 1 was a membranous sac, about the size of a hen's egg. The umbilical cord entered its anterior and inferior aspect. The cord contained only two vessels—an artery and a vein.

The sac contained a quantity of peritoneal fluid, (the proteid of which had been coagulated by the action of the spirit in which the specimen had been kept), the stomach, small and large intestines, and a flat mass in the wall of the sac which proved to be a large supra-renal capsule.

The stomach was imperfectly subdivided into four successive cavities. The duodenum ended blindly at its lower extremity.

No trace of a bile duct could be found. The small intestine consisted of about four coils, and was about 5 inches long. The large intestine was much coiled, and its length was about 4 inches. There was a cæcum and vermiform appendix. The rectum was straight and occupied the middle line; it opened on the posterior aspect of the vulva.

The intestines were distended by a brownish putty-like substance, which was found to be free of all traces of bile-salts and pigments; it consisted chiefly of epithelium and coagulated protoid.

No. 2 was a membranous sac measuring 1 inch by $\frac{1}{2}$ inch. It contained turbid fluid. A thickening in one part of its wall presented on section a cavernous structure.

No. 3 was another membranous sac, slightly smaller than No. 2. It contained a similar fluid.

Nos. 2 and 3, as far as we could make out, represented large vessels entering and leaving the heart.

No. 4 was a small solid mass, consisting of connective tissue and fat. A pit on its surface led down to a canal at the bottom of which the malleus was found. This was evidently the auditory pit.

No. 5 was a small pedunculated mass. On cutting into it we found a developing tooth consisting of a cap of dentine and a tooth papilla.

This mass must be the remnant of the maxillary process or the mandibular arch.

No. 6 was a doughy lobulated mass, consisting of connective tissue and fat.

No. 7 had a similar structure to No. 6.

No. 8 was solid mass which was covered by a thin membrane which easily peeled off its surface. This mass proved to be a thick-walled heart.

The single cavity of the heart was represented by a coarsely cavernous structure, some of the bands resembled muscoli papillares and cordæ tendinæ.

Nos. 9 and 10 were two lateral masses, consisting chiefly of fatty connective tissue. These rested on a bony basis, in the neighbourhood of which muscular tissue was found. A small quantity of scalp hair grew from the upper surfaces of these masses. On further dissection of this part of the monster irregular pieces of bone were found. Two of these were the innominate bones; and the remaining two or three pieces represented the sacrum and possibly portions of vertebræ.

REMARKS.

The following are the points of interest to which we wish to draw attention :—

The absence of any nervous structure, central or peripheral, in the monster on strict anatomical and microscopical search.

The greater portion of the monster consisted of connective tissue structure, some of which showed great exuberance of growth. For example, the greater bulk of the limbs consisted of areolar and fatty tissue. Part of this connective tissue very probably represented mesoblastic cell collections, which were originally intended for the formation of higher type tissues.

The central vascular structures, *i.e.*, the heart and great blood vessels, were imperfectly developed, being represented by cavernous tissue.

Taking into consideration the size and thickness of the heart it must have acted very vigorously in order to force the blood through the cavernous aorta into the peripheral vessels. It is of interest to note that the heart resembled in its cavernous structure that of the frog.

As regards the abdominal organs, the stomach, as noted, was imperfectly divided into four cavities, reminding us of the ruminant type. The absence of bile-salts and pigment in the intestinal contents is accounted for by the non-development of the liver.

The presence of a large supra-renal capsule in the absence of a nervous system is remarkable, as it is so closely associated in its development with that system.

The unbridled growth of the connective tissue structures may be explained, we think, by the lack of nervous trophic control from an early period of embryonic life.

Lastly as to causation.—

The abnormalities and deficiency met with in the monster may be accounted for by nutritive defects and absence of nervous guidance. When the abnormal structure of the heart and large vessels are borne in mind, it is not difficult to understand that many vessels might have remained undeveloped, and that the heart found it impossible to force blood through the cavernous aorta into certain special vessels.

We do not think that mechanical pressure can be considered as a factor in causation.

A CASE OF INSULAR SCLEROSIS.

BY SURGN.-CAPT., S. E. PRALL, M.B.

The case I have the honor of bringing to your notice in the present short paper came under my care in the Clinical Ward No. 4 of the J. J. Hospital while Dr. Childe was away on his holiday, and he has kindly permitted me to bring it forward for your consideration this evening.

If any excuse were necessary for recording an isolated case of this kind, I would plead that the disease is one of rarity and of interest, and, as such, is deserving of careful study.

It will be well, in the first place, to give you a short account of the symptoms as we observed them in the first few days of the patient's stay in hospital and then to proceed to a short commentary on the special points of interest he shows. The history I was able to obtain was simply that he had been brought into the hospital, having been picked up in a fit in the street.

When I first saw him, the symptom that immediately attracted my attention was the ataxic and violently tremulous character of the movements that his hands performed in the act of raising them to the forehead in making his preliminary *salaam* to me. He placed his hands together and strove to raise them to his head, and the nearer they came to their destination at the forehead the more violent, the more uncertainly tremulous, the more seemingly ataxic they became, and the greater was the difficulty both in keeping them together and in applying them to the head. When they were laid by his side on the bed, they were at once quiet, only to be again agitated on his attempting any voluntary movement, such as shaking hands with me, &c. Raising a spoonful of water to the mouth produced these waving motions with increased violence the nearer the spoon came to the mouth, the water in the spoon was thrown on to his shoulder and beard, and the spoon rattled against the teeth on reaching the mouth. His lower extremities were similarly agitated on my desiring him to place his feet one by one in my hands, held about a foot above his bed. There was general loss of power and no disorder of sensation and no rigidity, though he was observed to lie, as a rule, with his legs flexed on the trunk and adducted. On raising him to a sitting position, his head which had previously rested quietly on his pillow, fell forward, and commenced a rhythmical tremor from side to side. These are his chief motor symptoms. His mental state is that commonly seen in this disease and which in former days led to the confusion of it with general paralysis of the insane. He is generally in an emotional condition, either laughing or crying without apparent reason, and does not seem on the whole unhappy. Charcot records two cases in which the true *delire des grandeurs* was present in undoubted cases of insular sclerosis.

Another marked symptom that this patient shows is his characteristic speech. He speaks very slowly and in a monotone as though he were

reading with difficulty, or intoning some sacred passage in a manner commonly observed in this country. Also his utterance is thick, and it is difficult to catch what he says; indeed, it is sometimes quite impossible. This is the speech that is alluded to by authors as the 'scanning' speech. There is no interference with the functions of the rectum or bladder.

Charcot in his description mentions a cerebral, a spinal, and a cerebro-spinal form of the disease, but both he and other authors, notably Moxon and Fagge, agree that the cerebro-spinal form is the usual one and that the others are rare, though the rarity, it is suggested, may be that of recognition as well as that of occurrence. The division is of course, founded on the locality of the grey patches which, form the characteristic lesion in the disease. These are generally scattered all throughout the brain and spinal cord, and naturally, as there is no rule for their regular distribution, so is there variation in the symptoms observed in different cases. However, there is for all cases a general average of the symptoms (Moxon) which occur with more regularity than one would think possible with so erratic a distribution of the lesions causing them.

Diagnosis.—The diagnosis of this disease has to be made from chorea, tabes, paralysis agitans, general paralysis of the insane, and mercurial tremor. From chorea the main point of distinction is that the tremor ceases when the part is supported, and is increased to violence on making a voluntary effort; also there is a certain rhythm in it which differentiates it from the wild movements of chorea. It is the character of the tremor, also, which helps us to diagnose the disease from paralysis agitans; it only shows itself when voluntary movements are made, and subsides when the patient is at rest. I admit that the head tremor is apt to be confusing, but still the complete arrest of the tremor of insular sclerosis when the part is supported and the extraordinary increase it manifests on exertion or the influence of emotion should confirm the diagnosis. The cone-shaped hand of paralysis agitans is absent in this disease.

To again allude for a moment to chorea. I should have further said that in the case of chorea tremor, if the patient tries to make a voluntary effort, such as lifting water to the mouth, he may fail to effect his object; whereas in insular sclerosis, though the action is hindered by the tremor, and the more so by the increasing violence of

it as the goal is nearly reached, yet the mouth is eventually reached. Charcot says that the main direction of the movement persists in spite of the obstacle caused by the jerks of the tremor. Also the movements of chorea show themselves without any cause, whereas the tremor of insular sclerosis is only shown on the attempt to make a voluntary effort.

With regard to the diagnosis from tabes, the ataxic movements do not at any time show any rhythm, such as is shown by the movements of insular sclerosis. There are no rhythmical jerks, but disorderly gesticulations; the classical failure to stand with the eyes closed in ataxia does not exist in insular sclerosis.

In taking leave of the tremor it is necessary to point out that it does not last as long as the disease, being replaced in the later stages by the rigidity of the limbs, which closes the case.

The patient under observation does not present any optical symptoms. The most common of these, in (half the cases) nystagmus, is important as a diagnostic, and I at first attributed some importance to its absence in this case. Since, however, I found that Charcot lays down that it may be absent in half the total number of cases, I had no further doubt on the point. Transient diplopia is described and also amblyopia, which may be co-existent with an apparently unaffected disc. This patient shows no eye symptoms, so I will dismiss this part of the question, only thanking Dr. Herbert for the careful examination he made of the eyes with only a negative result.

Finally, we come to the diagnosis from general paralysis of the insane. This is the most difficult, since the speech in the two diseases is so alike, and the mental condition also shews many points of resemblance, we are driven back to the motor phenomena to clinch the diagnosis. Our present patient is a good example of the close resemblance of the two diseases; indeed, were it not for his motor symptoms, he would do well for a case of general paralysis. According to the accounts of the disease, this resemblance of the speech especially is constant throughout the two diseases commencing with a slight clipping of the words and proceeding to the most unintelligible utterances of the very, very drunk. When we have, as Charcot says, the grand ideas existing as well, the difficulty of distinguishing the two conditions is increased; indeed, he confesses that without the aid of other symptoms it may be impossible.

The patient also presents other symptoms, if I remember rightly, of commencing bulbar paralysis, and these are important, as it is from accidents arising from this disorder that the fatal event is hurried on or actually determined.

Vertigo is described, but I did not observe it in the patient.

The almost entire absence of disorders of sensations is remarkable, and forms one more aid to the distinction of the disease from tabes; and I might here also allude to the undoubted loss of power in the lower limbs, the existence of ataxic symptoms with this weakness serving as another point of distinction between the two. A point of resemblance between the two is the existence of gastric crises in both.

I might conclude with a reference to the peculiar seizures or fits that the subjects of this disease are liable to. This patient was said to have been picked up in the street in a fit, but he has not, so far as I know, had another. I remember, however, a case in Guy's Hospital under the care of the late Dr. Moxon, who, I may venture to remind you, first described insular sclerosis and give it its English name. This patient used to have fits often, and would lie unconscious and shaking for hours; in one of these fits his temperature suddenly ran up, and he died, and the grey patches were found throughout his brain and spinal cord at the autopsy. Charcot describes a case in which death took place in an exactly similar manner.

I fear that I have already exceeded my time limit, so I will conclude here by thanking you for the patient hearing you have given me. The patient is still an inmate of Dr. Childe's ward, and I daresay Dr. Childe may have made some more observations on him since I handed him over.

THE BOMBAY MEDICAL AND PHYSICAL SOCIETY.

THE usual monthly meeting of the Bombay Medical and Physical Society was held in the University Library on Friday, 5th August 1898, at 5-15 p.m.

President—Surgn.-Lt.-Col. W. K. HATCH in the Chair.

Present: Dr. D. G. Galeotti, Surg.-Major W. H. Quicke, Surg.-Lt.-Col. W. G. H. Henderson, Surg.-Col. G. W. R. Hay, Brig.-Surg.-Lt.-Col. T. S. Weir, Surg.-Major J. J. Bourke, Dr. Edulji Nashirvanji, Dr. (Miss) A. M. Benson, Dr. (Miss) Ferreira, Surg.-Capt. C. H. L. Meyer, Dr. C. B. Stewart, Dr. E. L. Marsh, Dr. L. P. DoRozario, Dr. C. H. Cayley, Surg.-Capt. C. J. R. Milne, Dr. (Miss) Carthorn, Surg.-Capt. Dove, Dr. D. R. Bardi, Dr. R. M. Kalapesi, Dr. P. Lisboa, Dr. A. Meyer, with Surg.-Capt. H. Herbert, the *Honorary Secretary*.

Business :—

1. The announcement of Surg.-Lt.-Col. D. C. Davidson in place of Surg.-Major H. P. Dimmock on the Committee, and Surg.-Capt. C. H. L. Meyer in place of Surg.-Capt. H. Herbert, as Secretary, was made.

2. *Papers* :—

1. On the Action of the Plague Toxins on the Circulatory System, by Dr. Gino Galeotti.

2. A Case of Defective Facial Development, by Dr. (Miss) A. M. Benson, M.D., London.

3. A Statistical Investigation of the Difficulties and Errors in the Diagnosis of Enteric Fever from Clinical Symptoms alone, by Dr. E. L. Marsh.

The Chairman read two propositions sent down by SURG.-CAPT. G. S. THOMSON, Satara :—

1. That special subjects for discussion at a certain selected number of the Society's meetings be arranged for, and papers be read or submitted by specialists introductory to the discussions of such subjects.

2. That the transactions of the previous month's meetings be printed and circulated to all members at least one week before each subsequent meeting, together with printed copies of the Agenda Papers for the ensuing meeting.

No. 1 would be brought up for discussion at the next meeting. No. 2 was practically a complaint concerning the delay in appearance of the monthly reports. The chief cause of delay had always been the dilatoriness of members in sending in their papers and remarks. The Secretary often did not get all the matter for printing till ten days or a fortnight after the meetings. The Chairman called upon members to assist in the early publication of the reports in future by always supplying their remarks directly after the meetings.

The Agenda Papers had never hitherto been circulated to up-country members ; but an effort should be made to send them out to all members, so that remarks might be sent down by mofussil members to serve as discussion. The chief difficulty had been the fact that the papers to be read had often not been decided on till within a few days of the meetings.

ON THE ACTION OF THE PLAGUE TOXINS ON THE CIRCULATORY SYSTEM.

BY DR. GINO GALEOTTI,

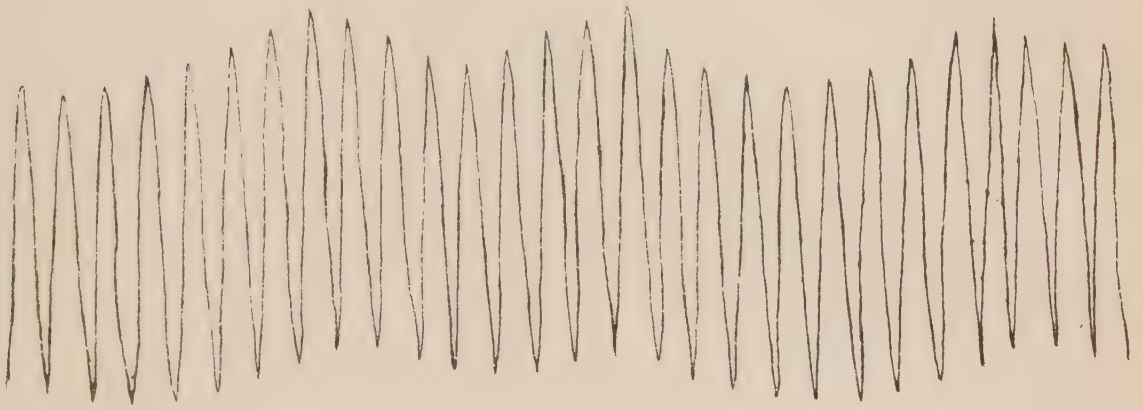
Lecturer on Experimental Pathology in the Royal University, Florence.

The tracings which I have the honour to show before the Medical and Physical Society were taken, in part from men infected with plague, in part from animals experimentally intoxicated. Comparing these tracings, we find some useful elements for the determination of the physio-pathological processes of plague.

In the first place it is necessary to mention some experiments made in the laboratory of experimental pathology at Florence. From the plague bacilli was extracted a substance having very characteristic properties. Its chemical properties indicate this substance to be a nucleo-proteid. Its action on different animals can be summarized as follows :—Inoculated in sufficient quantity, this substance is extremely poisonous ; in small quantities it makes animals quite refractory to the most virulent form of infection from plague. From the animals vaccinated many times with this substance there was obtained a serum with decidedly curative and preservative action.



*Tracing of the pulse of a man sick for two days
He died on the third day.*



*Normal curve of the blood pressure of a big
dog (of 52lbs. weight)*



*Anaerotic pulse of a man sick for three days
He was in very bad condition.*



*The same course after two hours of the intrave-
nous injection of a nucleo proteid solution
and a few minutes before the death.*

Making intra-parenchymal injections with a weak solution of this substance in different organs, large fields of coagulation necrosis are produced. Wherever the nucleo-proteid comes in contact with the cell protoplasm, it is rapidly coagulated and destroyed. Injected in large doses into the peritoneum or into the jugular vein of dogs or rabbits, this substance causes the death of the animals in a short time.

In order to investigate the action of this poisonous proteid on the circulatory system, many more accurate experiments were made, taking the curves of the blood pressure with a Baltzar's registering apparatus, from animals intoxicated with intra-peritoneal or intravenous injections. The conclusions formulated after these experiments can be summarized as follows :

The poisonous nucleo-proteid extracted from the plague bacilli is able to exercise two different actions on the circulatory system.

One of these actions is the consequence of a general property of the nucleo-proteids group to cause intravascular coagulation of the blood. Then, from this property, very interesting alterations of the pressure curve take place, because the coagulation is never simultaneously complete for all the blood-vessels, but little by little small thrombi are formed in different organs, and little by little certain vascular territories are closed to the blood-stream. Then the heart, trying to remove these obstacles, puts in action all its reserve force ; we can see an extraordinary increase in the height of the cardiac oscillations, and the death of the animals follows rapidly on these last efforts of the heart.

But not every time does this coagulation of the blood take place, and then it is possible to make evident the other action of this poisonous nucleo-proteid, an action which very probably is specific for this substance.

This action can be briefly defined as a paralysing influence on the elements of the circulatory system. In demonstration of this conclusion we have the following facts :

- (1) A lowering of the arterial pressure.
- (2) Decrease of the height of the cardiac oscillations, which follows uniformly and constantly the diminution of the pressure.
- (3) Decrease of temperature soon after the injection of a large dose of nucleo-proteid.
- (4) Venous stasis very diffused, which was always found in every *post-mortem* examination.

And now we shall consider the alterations of function in the circulatory system observed in plague patients. These alterations are generally much greater than those of the other infectious diseases. In plague the circulatory troubles sometimes are so prominent as to dominate over all the other symptoms. These facts, although known, were not studied in detail by those who occupied themselves in clinical research in connection with plague. I believed that the accurate study of these facts would not be useless ; and for this reason I, together with Dr. Polverini, examined the disturbances of the heart and of the pulse of many patients, by the usual clinical methods and with sphygmographic observations. Thus we got 89 tracings from plague patients in different stages of the malady. All these tracings show pronounced anomalies of different kinds ; and consequently it is possible to place them in several groups, every group having its special characteristics.

At present we shall consider only two of these groups—the more anomalous and typical ones. The tracings of the first group were taken from patients who showed a very special clinical tableau. They were generally in the first period of the malady (one or two days), and it seemed that they were not very bad. The common symptoms of plague were not pronounced: there was no delirium, no unconsciousness, no collapse, no alterations in the chest nor in the abdominal organs. But the examination of the pulse soon revealed the gravity of these cases, because it was like the pulse in *articulo mortis*—the pulse which has received the name of *pulsus vermicularis*. On palpation it was very frequent (160—180) and compressible. The heart was always extremely weak, and its sounds hardly perceptible. There was no enlargement of its transverse diameters. These patients died generally a few hours after their admission into the hospital.

The sphygmographic tracings taken from these patients show the following characters :—The primitive elevation is extremely small ; the angle on the vertex is ample ; the rebound elevation is hardly visible ; there are no elasticity oscillations ; the rhythm is sometimes irregular.

These tracings are the expression of an extreme weakness of the heart, and they show also that the systole is not synchronic for all the fibres of ventricular myocard ; that the blood pressure in the arteries is excessively low, although the wall tension of the arteries is not completely lost.

The tracings belonging to the second group above mentioned show also a very small and round primitive elevation; but they have, as a principal characteristic, a more or less pronounced dicrotism, which can sometimes come to be an exaggerated anacrotism. These tracings were taken from patients who were in the third or fourth day of the disease. They had sometimes delirium; sometimes great depression and unconsciousness. The heart was a little enlarged; its sounds were confused and very frequent. Generally they died suddenly on the fifth or sixth day.

In these tracings we can read the same facts as in the others, only there is here something more—the dicrotism, which is the expression of a great laxity of the arteries. It seems that the same factors, which weakened the myocard, have now paralysed also the muscular tunic of the arteries.

All these alterations so rapidly rising up and so fatal show, without doubt, that in plague there is a notable intoxication of certain elements of the circulation; and since sometimes these alterations of the circulatory function are very marked when the other systems seem scarcely affected, it is to be concluded that the poison in plague acts with preference on the organs of the circulation. It is not yet decided which are the elements affected, whether the muscular fibres of the heart and of the arteries, or the intrinsic nervous centra of these same organs, or the extracardiac and vasomotor centra. With further experiments I hope I shall be able in the future to solve this question.

Comparing these clinical observations with the experiments first mentioned, the hypothesis of a specific intoxication of the elements of the circulatory system is confirmed. In both the cases there is an enormous decrease of the blood-pressure in consequence of the always decreasing energy of the myocard.

It is very probable that the poisonous substance is the same in both cases; that is the nucleo-proteid, which composes the body of the plague bacilli, which was extracted from them by a chemical process and used for experiment on the animals.

The tissues of the human organism, as is well known, can display a powerful dissolving action. It is then not impossible that the plague bacilli growing in the tissues of the patients are in part

destroyed, and that the nucleo-proteid which exists in them, dissolved in the liquids circulating in the tissues, enters the blood and displays its toxic action, as in the cases of the injection of such substance in animals for experimental purposes. This hypothesis is confirmed also by the results of the *post-mortem* examination made on the patients who died of plague and on the animals (dogs, rabbits, monkeys) intoxicated with the abovementioned nucleo-proteid, because in both the cases were found the appearances of a great generalized stasis, hæmorrhages diffused in every part of the body, and coagula in some large venous sinuses. And it is also confirmed by a comparative microscopical investigation of the tissues where the plague bacilli grew and of those which received intraparenchymal injections of the mentioned nucleo-proteid, because in both the cases a coagulation necrosis is to be observed as a principal appearance.

Thus it is possible that the poisonous element, on which depends a great part of the plague symptoms, is not an intracellular bacterial toxin (as is the case in other infectious diseases), but an extracellular one or, to better express it, that is the substance forming the greatest part of the body of the bacilli, which has specific poisonous properties.

SURG.-LT.-COL. W. K. HATCH said the paper read by Dr. Gallioti was important for two reasons, first, clinically, on account of the special action of the plague poison on the heart ; hence it was dangerous to allow any movement on the part of the patient. It was well known that in several instances the patient had died suddenly after getting out of bed in order to relieve himself, and probably a good many deaths attributed to fright during removal to a hospital were in reality due to sudden failure of the heart from exertion. Secondly, because the effects of inoculation in some cases may be due to this poison being present in the serum. The speaker himself was suddenly attacked by syncope, followed by collapse for more than an hour, and he was also called to see a neighbour—a skinny healthy European lad who had been inoculated that day, and who was seized with severe collapse and choleraic symptom from which he recovered by free stimulation.

DR. GALLIOTI in reply said that the poison was undoubtedly present in the serum, and he considered it to be the chief agent in prevention.





A CASE OF DEFECTIVE FACIAL DEVELOPMENT.

BY MISS A. M. BENSON, M. D. (LONDON.)

The child from whom the sketch was made was born in the Cama Hospital about June 20th. He is the first child of Beni-Israel parents, who have been married about 12 years. The parents deny having any deformity in themselves or their families. The child's weight at birth was about 4 lbs., and in every respect, except the face, he is well made.

The case is a good example of the rare deformity called "facial cleft." The cleft extends from just within the outer angle of the mouth to the central part of the lower eyelid, both angles of which and the lachrymal duct are complete. The floor of the orbit is defective, resulting in a considerable falling of the whole eye. The nose is perfect, but the whole central portion of the face has a considerable tilt to the left. The skin of the cheek ends off with a whitish border, and the floor of the cleft is soft and red, having a raw appearance easily distinguished from the mucous membrane. The anterior part of the alveolar process and of the palate is complete. The white median line of the palate bifurcates posteriorly, going on the left to the uvula which lies close to the left tonsil, and on the right soon stopping short at the posterior border of the palate. The right half of the palate is joined by a bridge behind the cleft to the posterior alveolar process of the superior maxilla. Thus, as concerns the bone, the cleft is a wide gap in the superior maxilla outside the incisor teeth. The malar bone is also deficient.

It is obvious that the position of the cleft is a good deal outside the usual position of harelip and cleft palate. Developmentally this facial cleft is due to a failure of the maxillary process to effect its due junction with the nasal processes in the early weeks of foetal life. Mr. William Rose, in his monograph on "Harelip and Cleft Palate" (1891), mentions that only one such case had been recorded in England but figures some from Germany, and gives a good account of the development of the parts concerned.

A STATISTICAL INVESTIGATION OF THE DIFFICULTIES
IN THE DIAGNOSIS OF ENTERIC FEVER FROM
CLINICAL SYMPTOMS ALONE.

BY ERNEST L. MARSH, M. B. (GLAS.), D. P. H. (OXON.),

*Late Senior Assistant Medical Officer, City of Glasgow Fever
Hospital, Belvedere.*

The importance attaching to the early and correct identification of sickness is well illustrated in the case of enteric fever—a disease which is specially potent for mischief when unrecognised. Many striking accounts of the spread of enteric fever in communities from causes connected with the misconception of the nature of the first case, or cases, occur throughout the successive annual reports of the Medical Officer to the Local Government Board of England. The incidental remarks attached to these reports emphasise the common failure to appreciate the presence of the disease owing to the enemy masking himself in a variety of unfamiliar forms. This variableness of the epidemic characteristics of the disease increases the difficulties that exist at the bedside; for the clinical manifestations of enteric fever, in common with other microbial diseases, are characterised by singular contrasts. The poison may occasion either an obscure *malaise*, a modified, a well-defined, or a malignant illness. The relation of the specific poison of enteric fever to a variety of clinical phenomena is indicated in a classification by Barnheim. This author, discussing the question in the *Medical Weekly* (Sept. 4th, 1892), differentiates not only (1) the normal three weeks' course, but (2) that with shortening of the ordinary period, or abortive typhoid, (3) that with prolongation of it, (4) that marked by recrudescence where a new evolution of bacilli takes place during a pyrexial period, (5) that marked by relapse where the new evolution occurs after convalescence has set in, and (6) that where secondary infection of streptococci or other micro-organisms asserts itself. Thus with the exception of the streptomycosis or other secondary infections, all the above varieties of illness result from an intoxication due to a special bacillus. It is easy to understand how confusion may be further confounded by the presence of any process complicating the attack of specific fever.

Any estimate of the influences that determine this variance of type must consider both the degree of susceptibility possessed by the

patient and the virulence of the infecting micro-organisms. While not prepared to express any opinion as to what part is played by natural immunity or by comparative insusceptibility in the individual, we have less difficulty in appreciating how the standard of virulence of specific organisms varies in its intensity. The occurrence of a variety of types is specially noticeable in epidemic prevalence of disease. There is a quotable reference to this subject in the *Practitioner* for June 1897, in which Sims Woodhead describes how "in the rise and fall of the severity of the disease in individual cases during the course of an epidemic, it becomes evident that although within certain definite limits the disease is specific in character, and the form and character of organisms producing it also within the same limits specific, these may become so far modified, as there is a gradual assumption of a more parasitic character as the organism passes through several patients, that the severity of the disease becomes modified or more accentuated. This has often been observed in the case of epidemics of scarlet fever, of small-pox, and similar diseases which are assumed to be spread by an organic and organised infective agent. A still more striking example has been furnished by the recent outbreak of bubonic plague, during which not only modifications—increase and diminution in the severity of the attack—have been observed as the epidemic has progressed, but the actual virulence of the organism has been found to be modified as the disease itself has altered in character."

When we revert to the actual experience of a large fever hospital admitting enteric fever—and I make use of the excellent records of cases admitted to the wards of the Municipal Fever Hospital, Belvedere, Glasgow—we are afforded a means of estimating the variety of types affected by the disease.

Of 9,334 cases of enteric fever treated in this hospital during the years 1871—95, the character of the attack had been clearly recorded in about 9,157 of the cases. Examining this mass of enteric records, and considering those cases *mild* in type in which the pathological process aborted after such simple treatment as dieting and confinement in bed—those cases *typical* in which there were diarrhœa and pronounced fever ending in recovery—those cases *severe* which either recovered or ended fatally after intestinal hæmorrhage, relapse, or marked toxæmia—and those cases *equivocal* or doubtful in which there were

little or no characteristic fever, and only negative or disputable symptoms, we obtain the following figures :—

| | "Mild" | "Typical" | "Severe" | "Equivocal" |
|-----------------|--------------------------------|-----------|----------|-------------|
| | 2,476 | 3,134 | 2,277 | 1,270 |
| | giving percentage respectively | | | |
| proportions of— | 27°/o | 34°/o | 25°/o | 14°/o |

Notwithstanding the fact that the above analysis must necessarily be only approximate, it will be seen that those admittedly powerful factors already indicated which influence the type of the disease tend to occasion difficulties in the diagnosis by producing extremely mild easily-overlooked types of the disease on the one hand and equivocal or aberrant types on the other.

Our immediate interest centres round the equivocal cases of enteric fever, of which there were some 14 per cent. in the mass of enteric cases treated in Belvedere Hospital during the period mentioned above. These form the type of cases so difficult to associate with the specific bacteria of enteric fever. In order to illustrate the important position that equivocal cases occupy as an element of confusion in the diagnosis of enteric fever, the following table exhibits the actual prevalence of this type of case in relation to those unequivocal types, whether mild, typical or severe, treated in hospital in each of the five quinqueniads embraced in the period under investigation.

Table showing analysis of 9,157 cases of enteric fever according to their clinical types and their relation to a particular quinquennial period between 1871 and 1895 ; also the "type" percentage of total cases in each period :—

| Five-yearly periods. | | | | " Mild." | " Typical." | " Severe." | " Equivocal." |
|---|-----|------------|-----|----------|-------------|------------|---------------|
| 1871—75 | ... | ... | ... | 307 | 427 | 244 | 200 |
| 1876—80 | ... | ... | ... | 598 | 595 | 510 | 405 |
| 1881—85 | ... | ... | ... | 573 | 700 | 469 | 238 |
| 1886—90 | ... | ... | ... | 342 | 588 | 402 | 176 |
| 1891—95 | ... | ... | ... | 656 | 824 | 612 | 251 |
| | | | | 2,476 | 3,134 | 2,277 | 1,270 |
| Percentage of total cases in each period. | { | 1871—75... | | 26% | 36% | 21% | 17% |
| | | 1876—80... | | 28% | 28% | 25% | 19% |
| | | 1881—85... | | 29% | 35% | 24% | 12% |
| | | 1886—90... | | 23% | 29% | 26% | 12% |
| | | 1891—95... | | 28% | 35% | 26% | 11% |
| | | | | 27% | 34% | 34% | 14% |

Confining our attention to the data regarding the equivocal cases, it will be seen that they, as was already stated, equal 14 per cent. of the total. Examination in detail shows that during the years 1876—80 as large a proportion as 19 per cent. of the cases were of this type. The subsequent quinquennia yield smaller proportions; but even this reduction leaves fully one equivocal case in every ten admitted to hospital.

It is interesting to note in the above table how the occurrence of a large proportion of "typical" cases among the admissions to hospital (see the periods 1881—85 and 1891—95) corresponds with a reduction in the number of equivocal or doubtful cases. The increase in typical cases noted above was connected in both periods with epidemic outbreaks of enteric fever. The explanation of the large proportion of "typical" cases characteristic of the period 1871—75 lies in the fact that the hospital was but recently established at that time, and received the patronage of many striking and typical cases.

A careful examination of the records of the clinical phenomena presented by the 1,270 equivocal cases showed that about a third of them, or 31 per cent., do not read as cases of enteric fever at all, while the remaining two-thirds, or 69 per cent., were cases for the most part only presumably enteric, the presumption being based in part on their association with well-marked cases, or on hearsay evidence regarding illness prior to admission.

The situation regarding not a few of these cases is thus described by Dr. Allan, the late Superintendent of the hospital, in his recorded opinion of the diagnosis: "I believe," says Dr. Allan of a certain case, "that the specific contagion of enteric fever has been received into this man's system, but that it has either failed to produce the usual results, or has done so only in a limited and ineffectual way." Of another case he remarks: "The temperatures do not support the diagnosis of enteric fever, though it may be quite possible, however, that this is the tail-end of a case of enteric fever." In many of these cases the diagnosis was eventually made clear by *post-mortem* evidence, and this usually proved the absence of enteric. In others there was evidence that the diagnosis lay between typhus and enteric fever, or tuberculosis and enteric fever, "the specific fever," to again quote Dr. Allan, "being grafted on pre-existing tubercular disease, the two diseases thus masking and mutually confounding each other." A further rough

generalization would place "head mischief," such as acute and chronic hydrocephalus, otorrhœa and its sequelæ, rheumatism, liver disorders, and, amongst females, puerperal conditions, uterine disorders, and neuroses attended with oscillations of temperature, prominent among the hundred-and-one conditions that disputed the diagnosis with enteric in the equivocal cases.

Thus the equivocal cases become reduced practically to a mass of cases erroneously designated "enteric" cases, or to disputable cases, or cases by association probably enteric becomes not distinctly anything else. It is certain that some 75 per cent. of these cases should never have been sent into enteric wards. The fact that someone had named them "enteric" was the only cause of enteric being discussed.

A consideration of the influence of sex in accounting for these results showed the association of 7.5 per cent. more females than males with equivocal cases. Under the age of 10 years this difference almost disappears. It is worthy of note as showing the influence of age that the proportion of children under 10 years of age among the equivocal cases amounted to almost 29 per cent., whereas the proportion of children under this age among all classes of cases was only 18 per cent. The average age of those cases furnishing equivocal types was 17 years. This agrees with one's experience of enteric, in that masking and blurring of types undoubtedly predominate in childhood and early youth. Indeed, both sex and age as important factors in producing *atypical* cases occur constantly in the experience of male and female enteric wards. In the latter, to which all children under six years of age are usually admitted, the presence of typical types is much rarer than in the male wards.

While *peculiarities in the type of the illness* often occasion difficulty in recognising the true nature of the disease, it is less with these differences that confusion occurs than with *certain diseases which simulate the action of the fever-poison*. The experience of Belvedere Hospital during a quarter of a century, with the errors in nomenclature connected with the admissions to the enteric wards, will help to illustrate these difficulties.

The total number of cases admitted to the enteric wards certified to be suffering from enteric fever during the 25 years under review was 12,554; and of these 9,025 proved to be genuine cases, showing 28 per cent. of error.

This amount of enteric fever was further augmented by 309 cases admitted to the hospital as typhus fever, or some other infectious disease. We thus get 9,334 genuine cases of enteric fever, of which 309 had been certified something else. It is difficult to get a common numerical expression for the total amount of error surrounding these 9,334 cases of genuine enteric. The 28 per cent. is quite clear; and the only way to combine the 309 additional cases is to take their percentage to 9,334 and add it to the former, *e.g.*, $3\cdot3 + 28 = 31\cdot3$ per cent. of blunders. It is better to keep them separate however, especially as in those cases sent erroneously in as enteric, we have quite a different set of facts to take into account from those in the 309 cases sent in as some other disease. Even with this exclusion, there remains an astonishing proportion of diagnostic error connected with enteric fever as seen in hospital.

As a convenient means of expressing the variety of morbid conditions mistaken for the specific infection of enteric fever, the initial division into, 1st, notifiable, and, 2nd, non-notifiable, diseases will be made. Under the heading "notifiable" are collected all the diseases mistaken for enteric which are now scheduled under the Infectious Diseases Notification Act. Of such diseases, there were admitted 1,416 cases out of the total 3,529 mistaken cases. This gives 40 per cent. of "notifiable" diseases, the remaining 60 per cent. representing diseases other than notifiable. The fact of notifiable diseases forming so large a proportion of the errors in the diagnosis of enteric fever adds some force to the argument that the present system of notification, with ultimate isolation in hospital, is beneficial to both patients and community. But, as will be seen from the following table, this class of diseases (notifiable) is becoming, in Glasgow at any rate, less and less important as a cause of confusion with enteric fever.

Table showing the percentage proportion of "notifiable" and "non-notifiable" diseases admitted to Belvedere Hospital unrecognised and in mistake for enteric fever during the five quinquennia between 1871 and 1895 :—

| Years. | 1871—75 | 1876—80 | 1881—85 | 1886—90 | 1891—95 |
|-----------------------------|---------|---------|---------|---------|---------|
| Notifiable diseases ... | 55 % | 50 % | 40 % | 31 % | 34 % |
| Non-notifiable diseases ... | 45 % | 50 % | 60 % | 69 % | 66 % |

These figures show that whereas in the five years 1871—75 more than half of the mistakes in diagnosis involved the admission to hospital of what are now notifiable infectious diseases, in the last five years the proportion has become reduced to about a third. This change is chiefly the result of the diminished prevalence of typhus fever and febricula—diseases which in the quinquennial period 1871—75 produced nearly 94 per cent. of the “notifiable diseases” mistaken for enteric fever, but in the period 1891—95 produced only a proportion of 67 per cent. With the withdrawal of epidemic typhus fever a truer expression of the more enduring elements of confusion is possible. These embrace a host of non-infectious general and local diseases, and not a few examples of *simple* continued fever, exanthematous fevers, diphtheria, puerperal fever, and erysipelas.

The following table shows both the actual number and the relative proportion of the diseases unrecognised until admitted to hospital in mistake for enteric fever during the 25 years under review :—

| Diseases admitted to the enteric wards. | | | | | | Number of cases. | Percentage proportions. |
|---|-----|-----|-----|-----|-----|------------------|-------------------------|
| Typhus fever | ... | ... | ... | ... | ... | 705 | 20.0 |
| Febricula | ... | ... | ... | ... | ... | 506 | 14.3 |
| Scarlet fever | ... | ... | ... | ... | ... | 119 | 3.4 |
| Measles | ... | ... | ... | ... | ... | 48 | 1.4 |
| Erysipelas and puerperal fever | ... | ... | ... | ... | ... | 26 | 0.7 |
| Diphtheria | ... | ... | ... | ... | ... | 5 | 0.2 |
| Small-pox and chicken-pox | ... | ... | ... | ... | ... | 7 | 0.2 |
| Pneumonia | ... | ... | ... | ... | ... | 702 | 19.8 |
| Phthisis pulmonalis | ... | ... | ... | ... | ... | 79 | 2.2 |
| Bronchitis and pleurisy | ... | ... | ... | ... | ... | 250 | 7.0 |
| Tuberculosis (various forms other than phthisis pulmonalis) | ... | ... | ... | ... | ... | 124 | 3.5 |
| Peritonitis | ... | ... | ... | ... | ... | 23 | 0.7 |
| Meningitis | ... | ... | ... | ... | ... | 74 | 2.0 |
| Rheumatism | ... | ... | ... | ... | ... | 44 | 1.3 |
| Typhlitis, simple diarrhoea and other bowel diseases | ... | ... | ... | ... | ... | 102 | 3.0 |
| Liver diseases | ... | ... | ... | ... | ... | 29 | 0.8 |
| Nervous diseases | ... | ... | ... | ... | ... | 67 | 1.9 |
| Miscellaneous diseases | ... | ... | ... | ... | ... | 323 | 9.2 |
| Negative or very obscure diseases | ... | ... | ... | ... | ... | 296 | 8.4 |
| Total | | | | | | 3,529 | 100.0 |

Thus of the total 3,529 cases of mistaken diagnosis, 1,416 belonged to the class of notifiable diseases, 1,031 to the category of pulmonary diseases, while the remaining 1,082 were cases of a miscellaneous nature : a proportion of 40, 29, and 31 per cent. respectively.

These errors would perhaps be more interesting if studied from the point of view of those who made them. But however desirable it might be to refresh the argument with a quotation of examples, the purpose in hand at the present time will only permit a statement of statistics. There is sufficient of detail in the table, however, to appreciate the nature of some of the clinical conditions responsible for the confusion connected with the diagnosis of enteric fever. This, when expressed in general terms, is seen to be occasioned by the clinical manifestations of—

- (1) certain specific fevers;
- (2) certain local affections producing febrile disturbances;
- (3) general diseases with or without some prominent local symptoms;
- (4) local disease of one organ alone.

The circumstance of a more or less acute onset associated with continued fever—dominant symptoms of enteric fever—and the co-existence of obscure local inflammatory action and general febrile disturbance appear to be the main pitfalls in the clinical diagnosis of enteric fever. The latter pitfall is exemplified in the well-defined group of pulmonary diseases which forms by far the most numerically important of the non-infectious diseases admitted to the enteric wards ; while the somewhat incongruous group of divers illnesses and diseases indicate the existence of the former one. And thus we are again forced to appreciate how considerable are the difficulties that invest the diagnosis of enteric fever from clinical symptoms alone.

Reference has been made to the effect of epidemic prevalence of enteric fever on the proportion of misnamed cases. In Belvedere Hospital the largest proportion of mistakes in any one year among the admissions certified enteric fever occurred in 1883, when as high a proportion of error as 80 per cent. was reached. Typhoid was at a low ebb in this year, only 362 cases being admitted to hospital. If years of active or epidemic prevalence be examined, *e.g.*, 1880 and 1895, when 874 and 600 cases respectively were admitted, the proportion of error is found to be minimal, namely, 25 and 14 per cent. respectively. The absence of epidemic prevalence of enteric fever is therefore an important factor in the production of a large amount of error in diagnosis.

It is worthy of note that some improvement in the amount of diagnostic error connected with the admissions to enteric wards has occurred in Glasgow within recent years. This improvement appears to admit of two explanations—(1) the operation of the Infectious Diseases Notification Act, and (2) the advantage taken by persons of a better class than formerly of hospital treatment. The Notification Act was adopted in Glasgow in 1890, and its chief object was to declare that the diseases therein scheduled should be thenceforth not alone the concern of the patient, or his friends, or his medical attendant, but also of the community. The increased concentration of attention on the diagnosis of enteric fever induced by the requirements of this Act may be readily credited with some of the diminution in the proportion of cases wrongly diagnosed—a diminution which has occurred notwithstanding the growing proportion of cases certified enteric fever placed under the test of hospital observation.

The other influence which appears to be operative lies, as already stated, in the fact that infectious diseases hospitals are now taken advantage of to a greater extent than formerly by persons of a better class, whose surroundings before removal admit of more careful and accurate observation and consequently less faulty diagnosis.

The praiseworthiness of the main intention of the Notification Act is, in the case of enteric fever, somewhat qualified by the fact that the notification of the patient's sickness and his removal to hospital is delayed as a result of the more careful consideration of the diagnosis required along with notification. From an examination of the records of the stage of illness in time, or "the day of the disease" in which patients were removed to hospital, the following interesting data are obtained. Of the 9,334 enteric admissions, it was possible to obtain information regarding the day of illness on admission of 8,231 cases. On analysis it was found that isolation in hospital was effected within seven days of the onset of symptoms in 22 per cent. of the cases; within 14 days of the onset of symptoms in 47 per cent.; within 20 days in 17 per cent.; within 27 days in 9 per cent.; within five weeks in 2·3 per cent.; within six weeks of 1 per cent.—the remaining few cases being ill seven weeks or more before admission to hospital. A special interest attaches to the examination of admissions in this way, as it supplies a statement of the time when the removal of the diseased from the healthy occurred. In the period covered by the operations of the Notification Act, *viz.*, 1891—95, the

proportion of admissions within seven days of the onset of symptoms was 16 per cent., or 9 per cent. lower than the mean of all the other periods: within 14 days of the onset of symptoms the proportion of admission was 39 per cent., or 12 per cent. lower than the mean of the earlier periods.

Another method of illustrating the difficulty attending the diagnosis of this most important preventible disease is by an enquiry into the length of time patients are kept under medical observation in their own homes before removal to hospital. For this purpose 206 consecutive enteric admissions were investigated, and the result showed that only five cases, or 2·4 per cent. of the patients, were removed to hospital on the day they were seen by the notifying physician. Of the others—

| | | |
|------------|-----------|---|
| 34 or 16·5 | per cent. | were removed after 1 day's medical observation. |
| 69 or 33·5 | " | " " " " 2 to 4 days' medical observation. |
| 42 or 20·4 | " | " " " " 5 to 7 " " " |
| 41 or 20 | " | " " " " 8 to 14 " " " |
| 10 or 4·8 | " | " " " " 15 to 21 " " " |
| 5 or 2·4 | " | " " " " more than 3 weeks' " |

The collection of this information led to the statement on the part of many of the certifying physicians—men often of considerable experience—that these cases would have been notified, and the patients removed to hospital much earlier, had it been possible to establish the diagnosis of enteric fever from the symptoms present when they first came under observation. That such would have been the case is easily understood when we consider that a large proportion of the above patients represented a class of the community whose removal to an isolation hospital is a *sine qua non* on the discovery of the true nature of their illness.

In conclusion, a consideration of the foregoing statements and statistics affords an estimation of the difficulties connected with the recognition of enteric fever by its clinical manifestation alone. These difficulties appeal to the experience of the medical officer of health, and the physician in charge of enteric wards no less than to the private practitioner. Any method that would lead to greater precision in the diagnosis of the disease must necessarily be adopted by all genuinely interested in its scientific treatment and prevention. The

value of bacteriological methods as adjuncts of clinical diagnosis suggests the kind of assistance required. The employment of the culture tube, and of the special tests known as the "sedimentation" and Widal's "agglutination" re-actions, would do much towards a scientific appreciation of enteric fever existing under any manner of disguise.

SURG.-LT.-COL. HENDERSON said :—" I should like to ask Dr. Marsh if he has had any experience of that form of typhoid fever described by Yeo and others as the 'ambulatory,' and which is naturally one of the chief bars to early diagnosis. I refer to those cases in which the symptoms are so slight that the patient is able to follow his usual avocations, and is hardly inconvenienced in any way by the attack, and who, if compelled to seek medical relief, is driven to do so at a late stage of the disease by the occurrence of some complication."

DR. MARSH replied :—" Ambulatory cases are extremely difficult to recognise in practice, unless by special means of investigation. Such cases of enteric fever form instances of pathogenic bacteria existing in a host, who, whether from comparative insusceptibility, or attenuation of the virulence of the infective agent, shows little or no indication of a toxæmia. The experience of the sanitary authorities of Glasgow in a recent epidemic of enteric fever in that city proved the value of the application of bacteriological methods for diagnostic purposes. The customers of a certain dairy began to sicken with febrile symptoms. Several of the first cases, which were mild in type, were isolated on the suspicion of enteric fever, and examined by means of Widal's test. The characteristic re-action was found to be demonstrable in each case. The immediate effect of this early appreciation of the nature of the epidemic was to lessen the mortality and to discourage any further extension of the disease. The same bacteriological test was the means of discovering the true source of the outbreak. One of the milkmaids, who had been sick but not so ill that she could not continue at her work, yielded positive results to Widal's test. Further investigation showed that the illness of this girl had been preceded by that of a mild continued fever in another member of the same family. In both cases the symptoms were so indefinite that the medical attendant did not consider them worthy of any special attention."

Dr. C. H. CAYLEY, M.A., M.B., B.C., D.P.H. (Cantab.), M.R.C.S., F.R.C.P., said :—" I wish to make a few remarks on Widal's serum test for enteric fever. Dr. Marsh in his paper has shown us what difficulties lie in the way of a correct diagnosis of enteric fever, and what a large proportion of cases are not recognized until late in the disease.

"An early diagnosis of enteric fever is most important from the point of view of a medical officer of health. In Widal's serum test we have a method by which enteric fever can not only be definitely diagnosed but also diagnosed as early as the fifth day of the illness.

"The simplest method of performing this test is as follows :—A small quantity of the patient's blood is drawn up into a capillary tube similar to that for carrying vaccine lymph. This can be either used at once, or kept for some length of time by sealing up the ends of the tube in a flame.

"The blood thus collected is then blown out into a watch glass; the clot comes out as a small thread, and with it a drop or two of clear serum. The serum can then be diluted to the necessary degree of dilution by the addition of sterile broth. A good general working dilution is 1 in 10. To obtain this eight drops of sterile broth are added to a drop of the serum, and to this mixture one drop of broth containing living virulent typhoid bacilli is added. A drop of this mixture is then put on a cover slip and examined as a hanging drop. If typhoid toxines are present in the blood, the bacilli, instead of swimming about the field, will adhere together in clumps and will lose their motility. Widal's re-action cannot well be carried out by a private practitioner, as a virulent culture of the typhoid bacillus is necessary; but the practitioner can always forward the sealed capillary tubes to a laboratory for examination and report, which can be supplied to him in a few hours. An early and reliable diagnosis of typhoid fever is so important a matter in public health that every large community should have a properly-equipped bacteriological laboratory, where private practitioners could have their diagnoses confirmed. Until this is the case there will always be mistakes in diagnosis. Cases of enteric fever will not be recognized until late in the disease, or will not be recognized at all, and such cases may be the starting point of an epidemic."

SURG.-LT.-COL. W. K. HATCH, remarking on Dr. Marsh's paper, said that the Society was much obliged to Dr. Marsh for his paper. If, as Dr. Marsh had shown, it was difficult to diagnose typhoid fever in a cold climate, then certainly in India it was infinitely more difficult. The rise of temperature was likely to be accompanied by a crop of sadumina, which entirely obscured the typhoid spot, and the diagnosis between typhoid and malarial fevers was very difficult: the patient might be a malarial subject, and this might modify the typhoid symptoms, or he might actually be suffering from both fevers at the same time. If Vidal's test and the presence of the plasmodium in the blood could be relied on as a certain means of diagnosis, then we were approaching the millennium as far as these two diseases were concerned. Personally not having had much to do with medicine for some years, Dr. Hatch was unable to say how far these test points could be regarded as absolute certainties in diagnosis.